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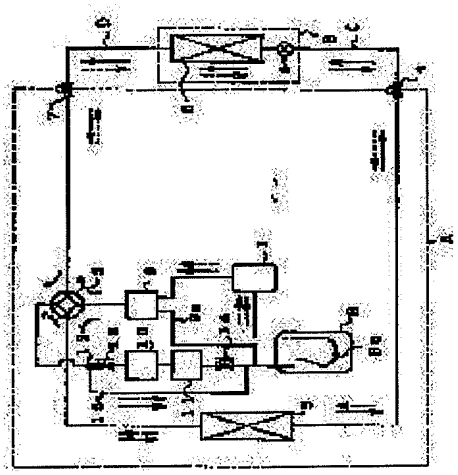
(71)Applicant : MITSUBISHI ELECTRIC CORP
(72)Inventor : HIRAI YASUYORI
TAKATANI SHIRO

(54) REFRIGERATING CYCLE DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To remove refrigerating machine oil before changing through adsorption and permeation respectively by a method wherein a refrigerating cycle device is provided in a specified pipeline with a first oil recovery device having a first filter device provided with an adsorption member arranged between fine by perforated members or a second oil recovery device having a second filter device and a refrigerating machine oil separating member.
SOLUTION: A heat source machine A and an indoor machine B are connected through a first connecting pipeline C and a second connecting pipeline D. An oil recovery device is provided in a pipeline between the outlet port of a heat source side heat exchanger 3, used for an evaporator, and the inlet port of a compressor 1 or in another pipeline between the outlet port of a utilizing side heat exchanger 6, used as the evaporator, and the inlet port of the compressor 1. The oil recovery device is a first oil recovery device 11 having the first filter device consisting of an adsorption member, arranged between the fine-hole members. In the other case, the oil recovery device is the second oil recovery device having the second filter device and a refrigerating machine oil separating member, which are provided at the opening unit of an inflow pipeline.



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CLAIMS

[Claim(s)]

[Claim 1] The heat souce which made piping connection of a compressor, the heat-source side heat exchanger, etc., and the interior unit which made piping connection of a flow regulator, the use side heat exchanger, etc., In refrigerating cycle equipment equipped with the 1st connecting piping and 2nd connecting piping which connect said heat souce and said interior unit For piping between the inlet ports of said compressor, from the outlet of said use side heat exchanger used as piping or the evaporator of a vestibule of said heat-source side heat exchanger used as an evaporator [of an outlet to said compressor] Refrigerating cycle equipment characterized by having the 1st oil recovery system which has the 1st filter equipment which has arranged the adsorption member between pore members or the 2nd filter equipment prepared in inflow piping opening, and the 2nd oil recovery system which has a refrigerating-machine-oil separation member.

[Claim 2] Refrigerating cycle equipment according to claim 1 characterized by the adsorption member of the 1st filter equipment of said 1st oil recovery system being activated carbon.

[Claim 3] Refrigerating cycle equipment according to claim 1 characterized by the adsorption member of the 1st filter equipment of said 1st oil recovery system being fibrous adsorption material.

[Claim 4] Said 1st oil recovery system is claim 1 characterized by having had the container which holds said 1st filter equipment, opening of inflow piping prepared in said container lower part, and opening of outflow piping prepared in said container upper part, and having said 1st filter equipment between said double door regio oralis, and refrigerating cycle equipment according to claim 2 or 3.

[Claim 5] The refrigerating-machine-oil separation member of said 2nd oil recovery system is refrigerating cycle equipment according to claim 1 characterized by the molecular size of a fluid penetrating the following [predetermined magnitude].

[Claim 6] The oil concentration detection equipment which detects the oil concentration of the predetermined refrigerating machine oil prepared in piping between the inlet ports of said compressor with said oil recovery system from the outlet of said use side heat exchanger used as piping or the evaporator of a vestibule of said compressor from the outlet of said heat-source side heat exchanger used as an evaporator, It has bypass piping which bypasses said oil concentration detection equipment connected through the piping switching unit, and said oil recovery system. When the detection concentration of the predetermined refrigerating machine oil of said oil concentration detection equipment becomes below a predetermined value It is refrigerating cycle equipment given in any 1 term among claim 1 to claims 5 characterized by

switching the flow of a refrigerant etc. to said bypass piping side with said piping switching unit from piping by the side of said oil concentration detection equipment and said oil recovery system.
[Claim 7] For piping which connects said oil concentration detection equipment and said oil recovery system, the upstream and the downstream of said both equipments are equipped with piping isolation equipment, respectively. When the detection concentration of the predetermined refrigerating machine oil of said oil concentration detection equipment becomes below a predetermined value Refrigerating cycle equipment according to claim 6 characterized by separating the flow of a refrigerant etc. with said piping switching unit, and separating said oil concentration detection equipment and said oil recovery system from piping by the side of said oil concentration detection equipment and said oil recovery system with a change and said piping isolation equipment to said bypass piping side.
[Claim 8] The heat souce which made piping connection of a compressor, the heat-source side heat exchanger, etc., and the interior unit which made piping connection of a flow regulator, the use side heat exchanger, etc., In refrigerating cycle equipment equipped with the 1st connecting piping and 2nd connecting piping which connect said heat souce and said interior unit Piping between the inlet ports of said compressor is equipped with an oil recovery system from the outlet of said use side heat exchanger used as piping or the evaporator of a vestibule of said heat-source side heat exchanger used as an evaporator. [of an outlet to said compressor] By the refrigerating cycle which uses the thing of the 1st existing refrigerant and updates newly said the 1st connecting piping and said 2nd connecting piping to the thing for the 2nd refrigerant using said heat souce and said interior unit Refrigerating cycle equipment characterized by carrying out washing operation of said the 1st connecting piping and 2nd connecting piping using said 2nd refrigerant and its refrigerating machine oil.
[Claim 9] Refrigerating cycle equipment according to claim 8 characterized by using hydro fluorocarbon, a hydrocarbon, ammonia, or a carbon dioxide as said 2nd refrigerant.
[Claim 10] Refrigerating cycle equipment according to claim 8 characterized by using an ether oil, ester oil, or an alkylbenzene oil as said refrigerating machine oil.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the refrigerating cycle equipment which uses refrigerants, exchanging them newly. Heat souce and an interior unit are updated to the new thing for refrigerants, and in more detail, without updating, it is refrigerating cycle equipment for which the refrigerant was exchanged newly, and the connecting piping which connects heat souce and an interior unit separates and collects the residual oil in connecting piping etc., and is related with the refrigerating cycle equipment which makes the reuse of connecting piping possible.

[0002]
[Description of the Prior Art] The conditioner equipped with the refrigerating cycle generally used conventionally is shown in drawing 9 . In drawing 9 , F is heat souce and builds in a compressor 1, a four way valve 2, the heat-souce side heat exchanger 3, the 1st actuation valve 4, the 2nd actuation valve 7, and an accumulator 8. G is an interior unit and is equipped with the flow regulator 5 and the use side heat exchanger 6. The 1st connecting piping C and the 2nd connecting piping D connect, and heat souce F and an interior unit G form a refrigerating cycle.
[0003] The end of the 1st connecting piping C is connected with the heat-souce side heat exchanger 3 through the 1st actuation valve 4, and other ends of the 1st connecting piping C are connected with the flow regulator 5. The end of the 2nd connecting piping D is connected through a four way valve 2 and the 2nd actuation valve 7, and other ends of the 2nd connecting piping D are connected with the use side heat exchanger 6. Moreover, oil returning hole 8a is prepared in the lower part of outflow piping of the shape of a U tube of an accumulator 8.
[0004] The flow of the refrigerant of this conditioner is accompanied and explained to drawing 9 . A continuous-line arrow head shows the flow of a broken-line arrow head's heating operation of the flow of air conditioning operation among drawing. First, the flow of air conditioning operation is explained. Through a four way valve 2, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 flows into the heat-souce side heat exchanger 3, and heat exchange of it is carried out to a medium here, and it is condensate-ized. The condensate-ized refrigerant flows into a flow regulator 5 through the 1st actuation valve 4 and the 1st connecting piping C, and it decompresses and will be in a low-pressure two-phase condition, and by the use side heat exchanger 6, heat exchange of it is carried out to a use medium, and it is evaporative-gas-ized. The evaporative-gas-ized refrigerant returns to a compressor 1 through the 2nd connecting piping D, the 2nd actuation valve 7, a four way valve 2, and an accumulator 8.
[0005] Next, the flow of heating operation is explained. Through a four way valve 2, the 2nd actuation valve 7, and the 2nd connecting piping D, the gas refrigerant of elevated-temperature high pressure compressed with the compressor 1 flows into the use side heat exchanger 6, and heat exchange of it is carried out to a use medium, and it is condensate-ized. The condensate-ized refrigerant flows into a flow regulator 5, is decompressed, will be in a low-pressure two-phase condition, and through the 1st connecting piping C and the 1st actuation valve 4, by the heat-souce side heat exchanger 3, heat exchange of it is carried out to a medium, and it is evaporative-gas-ized. The evaporative-gas-ized refrigerant returns to a compressor 1 through a four way valve 2 and an accumulator 8.
[0006] Conventionally, in such an air conditioning system, although CFC (chlorofluorocarbon) and HCFC (hydrochlorofluorocarbon) have been used as a refrigerant, in order that the chlorine contained in these refrigerants may destroy the ozone layer of a stratosphere, it is a pan for production regulation for abolition. As an alternative of these refrigerants, the conditioner using HFC (hydro fluorocarbon) which does not contain chlorine is implementation-ized.
[0007] When the conditioner using CFC or HCFC is superannuated, it is necessary to change to a new conditioner but, and since CFC and HCFC are set as the object of abolition and production regulation, it is necessary to change them to the conditioner using a refrigerant which is [HFC] different.
[0008]
[Problem(s) to be Solved by the Invention] However, since an available period is long and superannuation is not carried out compared with heat souce F and an interior unit B, either, if it can be used as it is, exchange of a conditioner is possible for the 1st connecting piping C which connects heat souce F and an interior unit G, and the 2nd connecting piping D at low cost in simple again.
[0009] However, a chlorine compound, a sulfur compound, etc. which mixed and deteriorated at the time of manufacture of the conditioner which used the chlorine compound and CFC which refrigerating machine oil, CFC, and HCFC in which the conditioner which used CFC and HCFC deteriorated deteriorated and generated, and HCFC for the connecting piping C which was being used with the conditioner which used CFC and HCFC, and connecting piping D remain.

[0010] If it is in the condition to which the above-mentioned residue remained mostly in connecting piping C and connecting piping D, for example, the conditioner using HFC is connected and connecting piping C and connecting piping D are used, refrigerating machine oil, an extant chlorine compound, an extant sulfur compound, etc. which deteriorated mix in the refrigerating machine oil for conditioners using HFC, degradation of the refrigerating machine oil for conditioners using HFC is promoted, and it is not desirable on the dependability of the conditioner using HFC.
[0011] For this reason, when the conditioner which used HFC for the 1st connecting piping C which was being used with the conditioner which used CFC and HCFC, and the 2nd connecting piping D was connected and connecting piping C and connecting piping D were used conventionally, the cleaning agent of dedication needed to wash connecting piping C and connecting piping D. They had the trouble that the cost concerning washing was high while these washing is very complicated and they required long duration.
[0012] This invention is complicated in the connecting piping used with the refrigerating cycle equipment which used CFC and the HCFC system refrigerant, long duration is required, and activity cost offers the refrigerating cycle equipment which can carry out a reuse, without performing washing by the high cleaning agent of dedication and which used refrigerants, such as HFC.
[0013]
[Means for Solving the Problem] The refrigerating cycle equipment by invention of claim 1 of this application The heat souce which made piping connection of a compressor, the heat-source side heat exchanger, etc., and the interior unit which made piping connection of a flow regulator, the use side heat exchanger, etc., In refrigerating cycle equipment equipped with the 1st connecting piping and 2nd connecting piping which connect said heat souce and said interior unit For piping between the inlet ports of said compressor, from the outlet of said use side heat exchanger used as piping or the evaporator of a vestibule of said heat-source side heat exchanger used as an evaporator [of an outlet to said compressor] It has the 1st oil recovery system which has the 1st filter equipment which has arranged the adsorption member between pore members or the 2nd filter equipment prepared in inflow piping opening, and the 2nd oil recovery system which has a refrigerating-machine-oil separation member.
[0014] Moreover, in invention of claim 1, the adsorption member of the 1st filter equipment of said 1st oil recovery system uses the refrigerating cycle equipment by invention of claim 2 as activated carbon.
[0015] Moreover, in invention of claim 1, the adsorption member of the 1st filter equipment of said 1st oil recovery system of the refrigerating cycle equipment by invention of claim 3 is fibrous adsorption material.
[0016] Moreover, in invention of claim 1, claim 2, or claim 3, said 1st oil recovery system is equipped with the container which holds said 1st filter equipment, opening of inflow piping prepared in said container lower part, and opening of outflow piping prepared in said container upper part, and the refrigerating cycle equipment by invention of claim 4 is equipped with said 1st filter equipment between said double door regio oralis.
[0017] Moreover, the refrigerating cycle equipment by invention of claim 5 is set to invention of claim 1, and the refrigerating-machine-oil separation member of said 2nd oil recovery system penetrates the following [magnitude predetermined in the molecular size of a fluid].
[0018] Moreover, the refrigerating cycle equipment by invention of claim 6 In invention of any 1 term of claim 1 to claim 5 The oil concentration detection equipment which detects the oil concentration of the predetermined refrigerating machine oil prepared in piping between the inlet ports of said compressor with said oil recovery system from the outlet of said use side heat exchanger used as piping or the evaporator of a vestibule of said compressor from the outlet of said heat-source side heat exchanger used as an evaporator, It has bypass piping which bypasses said oil concentration detection equipment connected through the piping switching unit, and said oil recovery system. When the detection concentration of the predetermined refrigerating machine oil of said oil concentration detection equipment becomes below a predetermined value, the flow of a refrigerant etc. is switched to said bypass piping side with said

piping switching unit from piping by the side of said oil concentration detection equipment and said oil recovery system.
[0019] Moreover, the refrigerating cycle equipment by invention of claim 7 In invention of claim 6, for piping which connects said oil concentration detection equipment and said oil recovery system When the upstream and the downstream of said both equipments are equipped with piping isolation equipment, respectively and the detection concentration of the predetermined refrigerating machine oil of said oil concentration detection equipment becomes below a predetermined value The flow of a refrigerant etc. is separated with said piping switching unit, and said oil concentration detection equipment and said oil recovery system are separated from piping by the side of said oil concentration detection equipment and said oil recovery system with a change and said piping isolation equipment to said bypass piping side.
[0020] Moreover, the refrigerating cycle equipment by invention of claim 8 The heat souce which made piping connection of a compressor, the heat-source side heat exchanger, etc., and the interior unit which made piping connection of a flow regulator, the use side heat exchanger, etc., In refrigerating cycle equipment equipped with the 1st connecting piping and 2nd connecting piping which connect said heat souce and said interior unit Piping between the inlet ports of said compressor is equipped with an oil recovery system from the outlet of said use side heat exchanger used as piping or the evaporator of a vestibule of said heat-source side heat exchanger used as an evaporator. [of an outlet to said compressor] By the refrigerating cycle which uses the thing of the 1st existing refrigerant and updates newly said the 1st connecting piping and said 2nd connecting piping to the thing for the 2nd refrigerant using said heat souce and said interior unit Washing operation of said the 1st connecting piping and 2nd connecting piping is carried out using said 2nd refrigerant and its refrigerating machine oil.
[0021] Moreover, in invention of claim 8, hydro fluorocarbon, a hydrocarbon, ammonia, or a carbon dioxide is used for the refrigerating cycle equipment by invention of claim 9 as said 2nd refrigerant.
[0022] Moreover, in invention of claim 8, an ether oil, ester oil, or an alkylbenzene oil is used for the refrigerating cycle equipment by invention of claim 10 as said refrigerating machine oil.
[0023]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained with reference to a drawing. In addition, among each drawing, the same sign is given to the same or a corresponding part, and explanation is omitted or simplified into it. Gestalt 1. drawing 1 of operation is drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 1 of implementation of this invention. In drawing 1 , A is heat souce and builds in the piping change-over valve 12 which are a compressor 1, the four way valve 2 which is a change-over valve which switches refrigerant flow, the heat-souce side heat exchanger 3, the 1st actuation valve 4, the 2nd actuation valve 7, an accumulator 8, an oil separator 9, oil concentration detection equipment 10, the 1st oil recovery system 11, and a piping switching unit, the 3rd actuation valve 13, the 4th actuation valve 14, and the bypass piping 15.
[0024] An oil separator 9 is formed in regurgitation piping of a compressor 1, and the refrigerating machine oil breathed out with a refrigerant is separated from a compressor 1. Oil concentration detection equipment 10 and the 1st oil recovery system 11 are connected with a four way valve 2 between accumulators 8, the end of oil concentration detection equipment 10 is connected to the 3rd actuation valve 13, and other ends are connected to the 1st oil recovery system 11. Moreover, the end of the 1st oil recovery system 11 is connected to oil detection equipment 10, and other ends are connected to the 4th actuation valve 14. 9a is the bypass way where the end was connected to the pars basilaris ossis occipitalis of an oil separator 9, and the other end was connected to the downstream from the outlet of the 1st oil-separation equipment 11. The piping change-over valve 12 is formed in order to change the refrigerant which flows from a four way valve 2, and refrigerating machine oil to the passage which flows into an accumulator 8 through the 3rd actuation valve 13, oil concentration detection equipment 10, the 1st oil recovery system 11, and the 4th actuation valve 14, and the piping change-over valve 12 and the passage which flows into an accumulator 8 through the bypass piping 15. Moreover, oil

returning hole 8a is prepared in the lower part of outflow piping of the shape of a U tube of an accumulator 8. B is an interior unit and is equipped with the flow regulator 5 (or flow control valve 5) and the use side heat exchanger 6.

[0025] C is the 1st connecting piping, the end is connected with the heat-souce side heat exchanger 3 through the 1st actuation valve 4, and other ends are connected with the flow regulator 5. D is the 2nd connecting piping, the end is connected through a four way valve 2 and the 2nd actuation valve 7, and other ends are connected with the use side heat exchanger 6. It is installed in the distant location, the 1st connecting piping C and the 2nd connecting piping D connect, and heat souce A and an interior unit B form a refrigerating cycle. In addition, although air conditioning operation which uses the use side heat exchanger 6 as an evaporator by this conditioner's using HFC as a refrigerant and switching a four-way switching valve 2, and heating operation used as a condenser are performed, since this actuation is common, explanation is omitted.

[0026] Next, when the conditioner using CFC or HCFC updates to the conditioner using HFC according to superannuation etc., heat souce and an interior unit are updated to the thing for HFC, and the connecting piping between heat souce A and an interior unit B shows the exchange procedure of the conditioner of the gestalt of this operation which carries out a reuse, without performing washing by the cleaning agent of dedication. CFCs or HCFC(s) which were being used for the conditioner using CFC or HCFC are collected, and it exchanges for the heat souce A and the interior unit B which kick the heat souce which was being used for the conditioner using CFC or HCFC, and an interior unit in the gestalt of this operation shown in drawing 1 . The 1st connecting piping C and the 2nd connecting piping D reuse the thing of the conditioner using CFC or HCFC. Since heat souce A is beforehand filled up with HFC, closed, the 1st actuation valve 4 and the 2nd actuation valve 7 carry out vacuum suction of an interior unit B, the 1st connecting piping C, and the 2nd connecting piping D in the state of connection, and carry out the 1st actuation valve 4, valve opening of the 2nd actuation valve 7, and additional restoration of HFC after that. Then, washing operation of the 1st and 2nd connecting piping C and D used with the conditioner using CFC or HCFC is carried out by operating the conditioner of the gestalt of this operation.

[0027] Next, the contents of washing operation of the 1st and 2nd connecting piping C and D used with the conditioner using CFC and HCFC by operating the conditioner of the gestalt of this operation are accompanied and explained to drawing 1 . A drawing solid line arrow head shows the flow of the washing pattern 1, and a broken-line arrow head shows the flow of the washing pattern 2. First, the washing pattern 1 is explained. With the refrigerating machine oil for HFC, such as ester oil, the gas refrigerant of HFC of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9.

[0028] Here, it dissociates, and the gas refrigerant of HFC and some refrigerating machine oil for HFC flow into the heat-souce side heat exchanger 3 through a four way valve 2, and the great portion of refrigerating machine oil for HFC carries out heat exchange to media, such as air and water, here, it condenses, and liquefies. The liquefied refrigerant flows into the 1st connecting piping C through the 1st actuation valve 4. When liquid cooling intermediation of HFC and the refrigerating machine oil for HFC flow the 1st connecting piping C The parts (the residue is called henceforth) of CFCs, such as mineral oil which remains to the 1st connecting piping C and which deteriorated, the refrigerating machine oil for HCFC and a chlorine compound, a sulfur compound, etc. It dissolves in the flowing liquid cooling intermediation of HFC and the refrigerating machine oil for HFC, and both flows, and according to both the shearing force by liquid cooling intermediation of HFC, and flow of the refrigerating machine oil for HFC, a part flows and flows into a flow regulator 5. Liquid cooling intermediation of HFC is decompressed to low voltage, and will be in the two phase condition of a low-pressure gas and a liquid, carry out heat exchange to use side media, such as air, by the use side heat exchanger 6, evaporate, and although gasified, here Some above-mentioned residues dissolve in the flowing liquid cooling intermediation of HFC and the refrigerating-machine-oil section for HFC, and it both flows, and a part flows according to both the shearing force by flow of the HFC refrigerant of a NI phase

state or a gas condition, and the refrigerating machine oil for HFC.
[0029] Evaporating, the HFC refrigerant and the refrigerating machine oil for HFC which were gasified flow into the 2nd connecting piping D with the residue which remained to the 1st connecting piping C. Some residues of the 2nd connecting piping D dissolve in the HFC refrigerant and the refrigerating machine oil for HFC of a NI phase state, and it both flows. Moreover, a part According to the shearing force by flow of the HFC refrigerant of a NI phase state or a gas condition, or the refrigerating machine oil for HFC It both flows and flows into the 2nd actuation valve 7 pan to the 1st oil recovery system 11 through a four way valve 2, the piping change-over valve 12, the 3rd actuation valve 13, and oil concentration detection equipment 10 with the residue in the 1st connecting piping C.
[0030] The concentration of the specific oil which was flowing with a HFC refrigerant and the refrigerating machine oil for HFC with oil concentration detection equipment 10, For example, it is used with the conditioner using CFC or HCFC, and the concentration of refrigerating machine oil, such as mineral oil which remained in connecting piping, can be detected. In washing operation of the connecting piping used with the conditioner using CFC and HCFC which used the conditioner of the gestalt of this operation When the concentration of the mineral oil which remains to connecting piping can be known to serial and change of the concentration reaches the desired value in washing operation That is, when the detection concentration of harmful predetermined refrigerating machine oil, such as mineral oil, becomes below a predetermined value, washing time amount can be completed and the effectiveness of washing operation can be raised. Moreover, in the 1st oil recovery system 11, it dissociates with the gas refrigerant of HFC, the refrigerating machine oil for HFC which dissolved the residue and the residue which flowed from the 1st connecting piping C and the 2nd connecting piping D is collected, and the harmful residues which remained in the connecting piping currently used with the conditioner using CFC or HCFC are collected. After that, the gas refrigerant of HFC flows into an accumulator 8 through the 4th actuation valve 14, and returns to a compressor 1.
[0031] After predetermined washing operation is completed, it changes from the circuit which passes the piping change-over valve 12 through oil concentration detection equipment 10 and the 1st oil recovery system 11 to the circuit which passes through the bypass piping 15, and the usual air-conditioning operation is attained. In addition, the detection approach of oil concentration detection equipment 10 and the recovery approach of the 1st oil recovery system 11 are explained later.
[0032] Next, the flow of the washing pattern 2 is explained. With the refrigerating machine oil for HFC, the gas refrigerant of HFC of elevated-temperature high pressure compressed with the compressor 1 has a compressor 1 breathed out, and flows into an oil separator 9. Here, the great portion of refrigerating machine oil for HFC is separated, and the gas refrigerant of HFC and some refrigerating machine oil for HFC flow into the 2nd connecting piping D through a four way valve 2 and the 2nd actuation valve 7.
[0033] When the gas refrigerant and the refrigerating machine oil for HFC of HFC flow the 2nd connecting piping D, some residues which remain to the 2nd connecting piping D dissolve in the flowing refrigerating machine oil for HFC, it both flows, and according to both the shearing force by flow of the gas refrigerant of HFC, and the refrigerating machine oil for HFC, a part flows and flows into the use side heat exchanger 6. The refrigerant which carried out heat exchange of the gas refrigerant of HFC to the use medium, carried out condensation and liquefaction here, and was condensed and liquefied flows into a flow regulator 5, it is decompressed to low voltage here, will be in the two phase condition of a low-pressure gas and a liquid, and will flow into the 1st connecting piping C.
[0034] It dissolves in the liquid cooling intermediation of HFC and the refrigerating machine oil for HFC used as the NI phase state of a gas and a liquid, and both flows, and a part flows according to both the shearing force by flow of the HFC refrigerant of a NI phase state, or the refrigerating machine oil for HFC, and some residues of connecting piping C are carried to the heat-souce side heat exchanger 3 through the 1st actuation valve 4 with the residue of connecting piping D. Here, heat exchange of the refrigerant of a gas-liquid two phase state is carried out to media, such as air and water, and it evaporates and is gasified. The gasified HFC

refrigerant flows into the 1st oil recovery system 11 through a four way valve 2, the piping change-over valve 12, the 3rd actuation valve 13, and oil concentration detection equipment 10 with the refrigerating machine oil for HFC, and the residue.

[0035] With oil concentration detection equipment 10, the concentration of the specific oil which was flowing with a HFC refrigerant and the refrigerating machine oil for HFC can be detected like washing operation of said washing pattern 1, the concentration of the mineral oil which remains to connecting piping can be known to serial, when the concentration reaches the desired value in washing operation, washing time amount can be completed, and the effectiveness of washing operation can be raised. Moreover, in the 1st oil recovery system 11, it dissociates with a gas refrigerant, the refrigerating machine oil for HFC which dissolved the residue and the residue which flowed from the 2nd connecting piping D and the 1st connecting piping C is collected, and the harmful residues which remained in the connecting piping currently used with the conditioner using CFC or HCFC are collected. After that, the gas refrigerant of HFC flows into an accumulator 8 through the 4th actuation valve 14, and returns to a compressor 1.

[0036] After predetermined washing operation is completed, it changes from the circuit which passes the piping change-over valve 12 through the 1st oil recovery system 11 to the circuit which passes through the bypass piping 15, and the usual air-conditioning operation is attained.

[0037] In addition, a washing pattern high [of cleaning effect] can be chosen according to the situation of the connecting piping washed although, as for the gas-liquid two-phase refrigerant [of the low-temperature low voltage / as for the high-pressure liquid cooling intermediation and 2nd connecting piping D, in the 1st connecting piping C, by the washing pattern 1, a low voltage gas refrigerant flows as mentioned above, and / connecting piping / C / 1st / in the washing pattern 2], and 2nd connecting piping D, an elevated-temperature high pressure gas refrigerant flows and a cleaning effect changes with washing patterns, and it can also combine. That is, selection of a washing pattern and combination can be taken into consideration by ** which can be well washed since the mineral oil which exfoliated from piping according to shearing force when a cleaning effect is [for mineral oil to exist in connecting piping mostly in early stages of washing operation, and to carry out washing operation with a gas refrigerant early / of the rate of flow] higher (it can wash away) and mineral oil also washed the minute amount by the two phase has specific gravity lighter than a refrigerant, it rises to surface after liquid cooling intermediation and it is carried.

[0038] In addition, during washing operation, since the refrigerating machine oil for HFC which flowed into the 2nd connecting piping D is separated and recovered by the 1st oil recovery system 11 from an oil separator 9, the refrigerating machine oil for HFC with which the compressor 1 was filled up decreases in number with the passage of time, but if additional restoration of the refrigerating machine oil for HFC of the amount which decreases in washing operation time is carried out from the time of a washing start up, it is satisfactory. Moreover, by changing from the circuit which passes the piping change-over valve 12 through oil concentration detection equipment 10 and the 1st oil recovery system 11 to the circuit which passes through the bypass piping 15, after predetermined washing operation is completed Oil concentration detection equipment 10 and the 1st oil recovery system 11 can be removed from the actuation valve 13 and the actuation valve 14 which are piping isolation equipment. Picking outside, the bottom, oil concentration detection equipment 10 and the 1st oil recovery system 11 can be reused for the other products of the gestalt of this operation, and can offer the oil concentration detection equipment 10 of the gestalt of this operation, and the 1st oil recovery system 11 by low cost.

[0039] Next, oil concentration detection equipment 10 is explained. Drawing 2 illustrates the example of oil concentration detection equipment 10. As for 10a, metal wire gauze-like filter 10f is prepared in the point for inflow piping by which a cylinder-like container and 10b were prepared in the upper part of container 10a. It is piping prepared in the lower part of container 10a, and bulb 10e (outflow piping for which 10c was prepared in the upper part of container 10a, and 10d) is prepared in the point. 10g and 10h are scuttles which consist of quartz glass which penetrates the light from light source 10i which emits the light. Moreover, 10j is a detector which detects the transparency reinforcement of the light from light source 10i.

[0040] The gas refrigerant of HFC which flowed from inflow piping 10b, the refrigerating machine oil for HFC, and the residue reach filter 10f, and refrigerating machine oil, such as mineral oil contained in the refrigerating machine oil for HFC and the residue here, serves as foamy or an oil droplet, passes filter 10f, and falls at the pars basilaris ossis occipitalis of container 10a. Moreover, the gas refrigerant of HFC which passed filter 10f flows out from outflow piping 10c with some of refrigerating machine oil, such as mineral oil contained in the refrigerating machine oil for HFC, and the residue, and residues.
[0041] The ester oil which is typical refrigerating machine oil used for the conditioner which used the HFC refrigerant of the gestalt of this operation The refractive index to the light whose wavelength is 540nm is 1.454. Again The principal component of the oil which remains to the connecting piping C currently used with the conditioner which used CFC and the HCFC refrigerant, and connecting piping D is refrigerating machine oil currently used with the conditioner which used CFC and the HCFC refrigerant. The refractive index to the light whose wavelength of the mineral oil which is the typical refrigerating machine oil is 540nm is 1.498. Drawing 3 is the relation of the refractive index to the light whose mineral oil concentration and wavelength of mixed liquor in ester oil are 540nm. From the relation shown in drawing, the concentration of ester oil and mineral oil can be known in the mixed liquor of ester oil and mineral oil by measuring the refractive index to the light whose wavelength of the mixed liquor is 540nm. Here, although the case where the wavelength of the light emitted from the light source was 540nm was shown, relation with the same said of the light of which wavelength emitted from the light source is realized.
[0042] Therefore, the concentration of the ester oil in container 10a and mineral oil can be known by emitting the light of specific wavelength, detecting the transparency reinforcement of light in detector 10j through the mixed liquor of 10g of scuttles, the ester oil accumulated into container 10a, and mineral oil, and 10h of scuttles, and calculating the refractive index of the mixed liquor of ester oil and mineral oil from light source 10i.
[0043] How to calculate the refractive index is explained based on drawing 4 from the transparency reinforcement of the light of the mixed liquor of the ester oil accumulated into container 10a, and mineral oil. In drawing 4 , the scuttle of n1 and 10j are the detectors which detect the reinforcement of light 10i, and a refractive index [as opposed to / refractive index / the light source to which 10i emits the light of specific wavelength, and / as opposed to the wavelength in 10g / the wavelength in the scuttle of n1 and 10h] is a refractive index [as opposed to the wavelength in air in n0]. Moreover, 10k, 10l., 10m, and 10n are 10l. of interfaces with the mixed liquor of air, 10g [of scuttles] interface 10k, 10g of scuttles and the refrigerating machine oil for HFC, and mineral oil, 10m of the mixture of the refrigerating machine oil for HFC, and mineral oil, and 10h [of scuttles] interfaces, and 10n of interfaces with 10h of scuttles, and air.
[0044] When the absorption to the light of a certain wavelength is small enough and the refractive index to the light of the wavelength generally lets the light pass in a different medium from na and nb, the permeability T of a transmitted light is as follows.
T=(4nanb)/(na+nb)2 [0045] Therefore, the permeability T of the light of the wavelength which the transparency reinforcement of the light of the wavelength will decrease according to an upper type by interface 10k, 10l. of interfaces, 10m of interfaces, and 10n of interfaces if the light of a certain wavelength is emitted from light source 10i as shown in drawing 4 , and is detected in detector 10j is as follows.
T={(4nzero n1) /(n0+n1)2}2x {(4none n2) /(n1+n2) 2} 2 [0046] Here, since n0 is the refractive index of the air over the light of the wavelength, it is a known value, and n1 can ask for the refractive index n2 of the mixed liquor of ester oil and mineral oil by using the scuttle of the known ingredient of a refractive index to the light of the wavelength.
[0047] Thus, the light of specific wavelength is emitted from light source 10i, the permeability of the light of the wavelength is detected by detector 10j, it is possible to ask for the refractive index n2 of the mixed liquor of ester oil and mineral oil, and the mineral oil concentration in ester oil as shown in drawing 3 , and the concentration of the mineral oil in the oil accumulated in container 10a from the relation of a refractive index can be known.

[0048] Thus, the concentration of oils, such as mineral oil, is detectable by measuring the permeability of through and mixed liquor for the light of specific wavelength, and calculating a refractive index in the mixed liquor of the refrigerating machine oil for HFC, and mineral oil. Here, although the case where the light emitted from the light source was the light was explained, the light emitted from the light source may be which light, such as infrared radiation and ultraviolet rays, and can detect the concentration of oils, such as mineral oil, similarly by using the detector corresponding to it. Moreover, although the detection means of the mineral oil concentration in the mixed liquor of ester oil and mineral oil was shown here, the concentration of mixed oil is detectable similarly about the mixed liquor of the oil of other components.
[0049] Moreover, ester oil and mineral oil which were accumulated into container 10a from bulb 10e can be discharged. After discharging these ester oil and mineral oil that were accumulated, the concentration of the ester oil collected further and mineral oil is detectable. If the mineral oil concentration collected after washing operation of fixed time amount can be detected with high degree of accuracy and the concentration of mineral oil has become below desired value, washing operation can be completed and shortening of the time amount of washing operation can be attained.
[0050] Next, the 1st oil recovery system 11 is explained. Drawing 5 illustrates the example of the 1st oil recovery system 11. A cylinder-like container and 11b are inflow piping by which outflow piping and 11c were prepared in the lower part of container 11a, and, as for 11a, 11d of pinholes by which an inflow is injected downward is prepared in the point. 11e and 11i are filters which are pore members, it is formed with a sintered metal and, as for the gap of Filters 11e and 11i, the solid particulate of the magnitude beyond this cannot pass Filters 11e and 11i by about 10 microns. 11f is fiber made from polypropylene, 11g is activated carbon and these are adsorption members. It is a filter for preventing the outflow of activated carbon, and 11h consists of glass wool. Although the 1st filter equipment is constituted from pore membere [11] and 11i, adsorption memberf [11] and 11g, and filter 11h, if adsorption members [11f and 11g] one side is arranged between pore member 11e and 11i at least, the role of the 1st filter will be played.
[0051] The residue in the HFC refrigerant which flowed from inflow piping 11c, the refrigerating machine oil for HFC, and connecting piping flows so that it may be injected toward a container 11a lower part from 11d of pinholes. The oil droplet of the residue in connecting piping, such as refrigerating machine oil for HFC sprayed on container 11a and mineral oil, piles up in the pars basilaris ossis occipitalis of container 11a, and is separated with a gas refrigerant. Here, some solid foreign matters contained in the residue in connecting piping precipitate with the refrigerating machine oil for HFC, mineral oil, etc.
[0052] The residues which were not able to precipitate at the pars basilaris ossis occipitalis of container 11a, such as refrigerating machine oil for HFC and mineral oil, go up the inside of container 11a with HFC, and reach filter 11e. Here, magnitude cannot pass a particle 10 microns or more. The residue in HFC which passed filter 11e, the refrigerating machine oil for HFC, and connecting piping C and D reaches adsorption material 11f.
[0053] 11f of adsorption members which are fiber made from polypropylene is oleophilic, and they adsorb oil, such as refrigerating machine oil for HFC, and mineral oil contained in the residue in connecting piping C and D. Moreover, the chlorine compound and sulfur compound which are dissolving into oils, such as mineral oil, are removable. Furthermore, some solid foreign matters contained in the residue in connecting piping are adsorbed by 11f of adsorption members.
[0054] HFC which penetrated 11f of adsorption members and the refrigerating machine oil for HFC, mineral oil, etc. reach to 11g of activated carbon. 11f of activated carbon has a vast specific surface area and pore structure, and it adsorbs the refrigerating machine oil for HFC, mineral oil, etc. 11g of activated carbon has the property to adsorb a nonpolar molecule rather, rather than the polar molecule, and the mineral oil which is a non-polarity is adsorbed more nearly alternatively.
[0055] Furthermore, 11g of activated carbon adsorbs the harmful chlorine compound and harmful sulfur compound which remain in connecting piping. Drawing 6 shows the adsorption engine performance of the chlorine compound by activated carbon, an axis of ordinate shows the

chlorine compound amount of adsorption per unit activated carbon, and the axis of abscissa shows the concentration of a chlorine compound. Here, although the adsorption property over the chlorine compound of activated carbon was shown, it has the adsorption engine performance with the same said of a sulfur compound. Thus, by using 11g of activated carbon, harmful oil, a chlorine compound, and ********** can be made to adsorb, and an injurious ingredient can be removed efficiently.

[0056] HFC which penetrated 11g of activated carbon arrives at the upper part in container 11a through filter 11h and filter 11i, and flows out from outflow piping 11b. In addition, even if it uses the 2nd (it indicates in gestalt 2 of operation) below-mentioned oil recovery system instead of the 1st aforementioned oil recovery system as an oil recovery system, the almost same effectiveness is acquired. That is, the 1st oil recovery system and the 2nd oil recovery system may be exchanged mutually.

[0057] Although the fiber made from polypropylene which is fibrous adsorption material as 11f of adsorption members was used in this 1st oil recovery system, the same effectiveness is expectable even if it, in addition to this, uses fibrous adsorption material, such as cellulose fiber, nylon fiber, polyester fiber, and glass wool, as an adsorption member.

[0058] Furthermore, in order to wash and collect efficiently the residues which remain in the 1st connecting piping C and the 2nd connecting piping D, the component which has a cleaning effect in the refrigerant circuit of the gestalt of this operation may be added, washing operation may be carried out, it can dissociate and adsorption material 11f and 11g of activated carbon can recover the component which was added in such a case.

[0059] As mentioned above, by installing oil concentration detection equipment 10 and the 1st oil recovery system 11 in a refrigerant circuit The harmful oil which remains to the 1st connecting piping C and the 2nd connecting piping D, a chlorine compound, Are complicated in the 1st and 2nd connecting piping C and D which could separate and collect sulfur compounds etc., could detect the specific oil concentration in a refrigerant circuit, and was used with the refrigerating cycle equipment using CFC and a HCFC system refrigerant. Long duration is required and activity cost offers the refrigerating cycle equipment which can be used without performing washing by the high penetrant remover of dedication and which used a refrigerant which is [HFC] different. In addition, the 1st oil recovery system establishes space in the adsorption member upper part and the lower part in a container, and makes it the structure which does not require dynamic pressure for an adsorption member. Since it is easy to adsorb so that contact time with an oil etc. is long, an adsorption member (especially activated carbon) establishes space in an inflow part, and reduces the rate of flow, and he is trying to flow into an adsorption member (after making it stabilized). When a cylinder container is used, a path comes size, the forge-fire rate of flow becomes slow, and adsorption effectiveness becomes good. Moreover, an oil droplet is separable from a refrigerant by putting in inflow piping 11c to the interior of a container, preparing 11d of openings downward and applying the oil droplet which flowed to a container wall. Moreover, it is considering as the structure of accumulating an oil in the container lower part, below the adsorption member by preparing inflow piping opening in the container lower part, and preparing opening of outflow piping in the container upper part above an adsorption member. Then, the oil which came out of inhalant canal opening of the container lower part collects on the lower part of a container, can decrease the mineral oil which goes up the inside of a container with a refrigerant gas, and does not need a superfluous adsorption member. Moreover, although the gestalt of this operation showed the example which connected oil concentration detection equipment 10 and the 1st oil recovery system 11 to this order at the serial Between the 3rd actuation valve 13 and the 4th actuation valve 14, piping connection is made or the 1st oil recovery system 11 is connected to juxtaposition through piping which bypasses oil concentration detection equipment 10, and only when detecting oil concentration with a closing motion valve, you may make it oil concentration detection equipment 10 pour a refrigerant etc.

[0060] With the gestalt of this operation, about the installation of the 1st oil recovery system 11 Although piping between the four way valves 2 and accumulator 8 inlet ports which switch refrigerant flow as mentioned above is the most desirable In addition, piping of the vestibule of

the outlet of the use side heat exchanger 6 used as piping or the evaporator of a vestibule of a compressor 1 from the outlet of a four way valve 2, and the piping of the vestibule of a compressor 1 and the heat-source side heat exchanger 3 further used as an evaporator to the compressor 1 To be (however, removing the 2nd connecting piping naturally), and what is necessary is just the location where a refrigerant condition is mainly concerned with a gas condition in short. When it considers as piping of the vestibule of a compressor 1 as an evaporator from the outlet of the heat-source side heat exchanger 3 using the installation of the 1st oil recovery system 11 When washing operation is performed from the washing pattern 2 and it considers as piping of the vestibule of a compressor 1 from the outlet of the use side heat exchanger 6 using an installation as an evaporator The refrigerant which contained the residue by carrying out from the washing pattern 1 can return to a compressor 1, after going via the 1st oil recovery system 11. the bad influence to a compressor can be lost (a ** -- the same is said of the 2nd oil recovery system 16 of the gestalt 2 of the below-mentioned operation about the installation of the 1st oil recovery system 11). Moreover, although the gestalt of this operation indicated the refrigerating cycle in which both heating operations (let the heat-souce side heat exchanger 3 be an evaporator) which use refrigerant flow as air conditioning operation which uses the change side and use side heat exchanger 6 as an evaporator, and a condenser by the four way valve 2 which is a change-over valve are possible, this technique can apply the use side heat exchanger 6 without the aforementioned change-over valve to the refrigerating cycle only for air conditionings used only as an evaporator, for example. In this case, washing operation is set to the washing pattern 1 which was naturally in agreement with the refrigerant flow of said refrigerating cycle, or 2 (also in the gestalt 2 of the below-mentioned operation, the same is said of this case). Moreover, although the example to which one interior unit B was connected was explained, it cannot be overemphasized that the same effectiveness is done so also with the conditioner by which two or more interior units B were connected to juxtaposition or a serial. Moreover, even if the ice thermal storage tub and the water heat storage tank are installed in the heat-souce side heat exchanger 3, a serial, or juxtaposition, it is clear to do the same effectiveness so. Moreover, it is clear that heat souce A does the same effectiveness so also in the conditioner connected to two or more set juxtaposition. Moreover, although the gestalt of this operation explained the air conditioning system, effectiveness with the same said of a refrigerator or a chiller is acquired.

[0061] When an ether oil, ester oil, or an alkylbenzene oil is especially used as refrigerating machine oil, The 1st existing connecting piping C which was being used for these refrigerating machine oil with the conditioner which used CFC which is the 1st existing refrigerant, and HCFC Since the mineral oil which is refrigerating machine oil of the conditioner which used CFC and HCFC which remains to the 2nd connecting piping D does not dissolve, When using the 1st connecting piping C which was being used with the conditioner which used CFC and HCFC, and the 2nd connecting piping D, it sets to the refrigerating cycle of a conditioner. The mineral oil which is the residue may dissociate, it may have a bad influence on a refrigerating cycle, sufficient washing is required, and especially washing operation by the conditioner of the gestalt of this operation is effective. Moreover, it sets to the conditioner using the hydro fluorocarbon, the hydrocarbon, the ammonia, or the carbon dioxide which is the 2nd refrigerant newly used as a refrigerant. The 1st connecting piping C which was being used with the conditioner which used CFC and HCFC It is hard to dissolve mineral oil and the chlorine-based compound which remain to the 2nd connecting piping D, and a sulfur system compound in the refrigerant of hydro fluorocarbon, a hydrocarbon, ammonia, or a carbon dioxide. It may have a bad influence on a refrigerating cycle, sufficient washing is required, and especially washing operation by the refrigerant by the conditioner of the gestalt of this operation used newly and its refrigerating machine oil is effective.

[0062] Gestalt 2. drawing 7 of operation is drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 2 of implementation of this invention. In drawing 7 , since sign B-D, 1-9, 12-15, and 9a are the same as that of the gestalt 1 of operation, they omit detailed explanation. In drawing 7 , E is heat souce, 16 is the 2nd oil recovery system, and the 2nd oil recovery system 16 is formed through

the 3rd actuation valve 13 and the 4th actuation valve 14, respectively between the four way valve 2 and the accumulator 8.
[0063] Moreover, the continuous-line arrow head in drawing shows the flow of the washing pattern 1, a broken-line arrow head shows the flow of the washing pattern 2, and since it is the same washing pattern as the gestalt 1 of operation, detailed explanation is omitted.
[0064] The 2nd oil recovery system 16 is explained. Drawing 8 illustrates the 2nd oil recovery system 16. Metal filter 16f of the shape of a wire gauze whose 16a is the 2nd filter equipment at a point for inflow piping by which a cylinder-like container and 16b were prepared in the upper part of container 16a is prepared. It is piping prepared in the lower part of container 16a, and bulb 16e (outflow piping for which 16c was prepared in the upper part of container 16a, and 16d) is prepared in the point. 16g is a rubber demarcation membrane which is the refrigerating-machine-oil separation member installed in the container 16a inside.
[0065] The HFC gas refrigerant which flowed from inflow piping 16b, the refrigerating machine oil for HFC, and the residue reach filter 16f, they serve as that the refrigerating machine oil for HFC and mineral oil are foamy, or an oil droplet, pass filter 16f, and result in 16g of rubber demarcation membranes here.
[0066] A rubber demarcation membrane penetrates the liquid below magnitude with a fixed molecular size. The molecular weight of the principal component of mineral oil is about 200-600, since the molecular weight of the principal component of the refrigerating-machine-oil ester oil for typical HFC is about 700-800, by using 11g of rubber demarcation membranes which can pass a with a molecular weight of 650 or less component, only mineral oil can pass 11g of rubber demarcation membranes, and it is accumulated in the pars basilaris ossis occipitalis of a container 16. Some ester oil which cannot pass 11g of rubber demarcation membranes flows out from outflow piping 16c with a HFC gas refrigerant, and a part piles up on 16g of rubber demarcation membranes.
[0067] Thus, a HFC refrigerant, the refrigerating machine oil for HFC, and mineral oil are separated inside container 16a. Moreover, the mineral oil accumulated in the container 16a pars basilaris ossis occipitalis is recoverable by opening bulb 16e through 16d of piping.
[0068] Thus, molecular size can separate and collect the mineral oil below fixed magnitude etc. alternatively by choosing a rubber demarcation membrane.
[0069] As mentioned above, by installing the 2nd oil recovery system 16 in a refrigerant circuit Are complicated in the connecting piping which could separate and collect efficiently oil, such as harmful mineral oil which remains to the 1st connecting piping C and the 2nd connecting piping D, and was used with the refrigerating cycle equipment using CFC and a HCFC system refrigerant. Long duration is required and activity cost offers the refrigerating cycle equipment which can be used without performing washing by the high penetrant remover of dedication and which used a refrigerant which is [HFC] different.
[0070] With the gestalt of this operation, although the example of the 2nd oil recovery system was shown as an oil recovery system, even if it uses the 1st oil recovery system indicated with the gestalt 1 of said operation instead of the 2nd oil recovery system, in the gestalt 1 of the aforementioned operation, the 2nd oil recovery system may be used instead of the 1st oil recovery system. Moreover, although the gestalt of this operation explained the example to which one interior unit B was connected, it cannot be overemphasized that the same effectiveness is done so also with the conditioner by which two or more interior units B were connected to juxtaposition or a serial. Moreover, even if the ice thermal storage tub and the water heat storage tank are installed in the heat-souce side heat exchanger 3, a serial, or juxtaposition, it is clear to do the same effectiveness so. Moreover, it is clear that heat souce A does the same effectiveness so also in the conditioner connected to two or more set juxtaposition. Moreover, although the gestalt of this operation explained the air conditioning system, effectiveness with the same said of a refrigerator or a chiller is acquired.
[0071] When an ether oil, ester oil, or an alkylbenzene oil is especially used as refrigerating machine oil, Since the mineral oil which is refrigerating machine oil of the conditioner which used CFC and HCFC which remains to the 1st connecting piping C which was being used with the conditioner which used CFC and HCFC, and the 2nd connecting piping D does not dissolve in

these refrigerating machine oil, When using the 1st connecting piping C which was being used with the conditioner which used CFC and HCFC, and the 2nd connecting piping D, it sets to the refrigerating cycle of a conditioner. The mineral oil which is the residue may dissociate, it may have a bad influence on a refrigerating cycle, sufficient washing is required, and especially washing operation by the conditioner of the gestalt of this operation is effective. Moreover, it sets to the conditioner using hydro fluorocarbon, a hydrocarbon, ammonia, or a carbon dioxide as a refrigerant. The 1st connecting piping C which was being used with the conditioner which used CFC and HCFC It is hard to dissolve mineral oil and the chlorine-based compound which remain to the 2nd connecting piping D, and a sulfur system compound in the refrigerant of hydro fluorocarbon, a hydrocarbon, ammonia, or a carbon dioxide. It may have a bad influence on a refrigerating cycle, sufficient washing is required, and especially washing operation by the conditioner of the gestalt of this operation is effective.

[0072]

[Effect of the Invention] Since this invention is constituted as mentioned above, the following effectiveness is done so. The refrigerating cycle equipment by invention of claim 1 of this application The heat souce which made piping connection of a compressor, the heat-source side heat exchanger, etc., and the interior unit which made piping connection of a flow regulator, the use side heat exchanger, etc., In refrigerating cycle equipment equipped with the 1st connecting piping and 2nd connecting piping which connect said heat souce and said interior unit For piping between the inlet ports of said compressor, from the outlet of said heat-source side heat exchanger used as an evaporator, or said use side heat exchanger The 1st oil recovery system which has the 1st filter equipment which has arranged the adsorption member between pore members, Or since it had the 2nd filter equipment prepared in inflow piping opening, and the 2nd oil recovery system which has a refrigerating-machine-oil separation member Even if it uses an established thing for the 1st connecting piping and 2nd connecting piping of a refrigerating cycle and changes a refrigerant and the refrigerating machine oil for the refrigerants into a new thing Separation recovery can be carried out from the refrigerant gas after the residue resulting from the refrigerant and refrigerating machine oil before modification of the 1st established connecting piping and the 2nd connecting piping changing in the 1st oil recovery system or the 2nd oil recovery system. especially -- an adsorption member and a refrigerating-machine-oil separation member -- the refrigerating machine oil before modification -- respectively -- adsorption treatment -- transparency removal can be carried out and the harmful nature of established piping can be reduced.

[0073] Moreover, in invention of claim 1, since the adsorption member of the 1st filter equipment of said 1st oil recovery system used the refrigerating cycle equipment by invention of claim 2 as activated carbon, it can carry out adsorption treatment of the chlorine compound and sulfur compound which the refrigerant which the adsorption treatment of the mineral oil used for the refrigerant containing chlorine can be carried out, and contains chlorine deteriorates, and are produced.

[0074] Moreover, in invention of claim 1, since the adsorption member of the 1st filter equipment of said 1st oil recovery system made the refrigerating cycle equipment by invention of claim 3 fibrous adsorption material, it can carry out adsorption treatment of the mineral oil used for the refrigerant containing chlorine. Moreover, the adsorption treatment of the chlorine compound and sulfur compound which are dissolving into an oil can be carried out.

[0075] Moreover, the refrigerating cycle equipment by invention of claim 4 In invention of claim 1, claim 2, or claim 3 said 1st oil recovery system Since it had the container which holds said 1st filter equipment, opening of inflow piping prepared in said container lower part, and opening of outflow piping prepared in said container upper part and had said 1st filter equipment between said double door regio oralis The oil which came out of inhalant canal opening of the container lower part collects on the lower part of a container, can decrease the mineral oil which goes up the inside of a container with a refrigerant gas, and does not need a superfluous adsorption member, but is adsorbed certainly, and separation removal is carried out from a refrigerant gas.

[0076] Moreover, since the refrigerating cycle equipment by invention of claim 5 is set to invention of claim 1 and penetrates the following [magnitude predetermined / member / of said

2nd oil recovery system / refrigerating-machine-oil separation / in the molecular size of a fluid], it separates bigger ester oil than that of a molecule, and mineral oil smaller than that of a molecule, and can carry out separation removal of the refrigerating machine oil with the harmful refrigerating machine oil with which molecular weight differs so that mineral oil can be removed, for example.

[0077] Moreover, the refrigerating cycle equipment by invention of claim 6 The oil concentration detection equipment which detects the oil concentration of the predetermined refrigerating machine oil prepared in piping between the inlet ports of said compressor with said oil recovery system in invention of any 1 term of claim 1 to claim 5 from the outlet of said heat-source side heat exchanger used as an evaporator, or said use side heat exchanger, It has bypass piping which bypasses said oil concentration detection equipment connected through the piping switching unit, and said oil recovery system. Since the flow of a refrigerant etc. is switched to said bypass piping side with said piping switching unit from piping by the side of said oil concentration detection equipment and said oil recovery system when the detection concentration of the predetermined refrigerating machine oil of said oil concentration detection equipment becomes below a predetermined value It can know that washing of predetermined refrigerating machine oil harmful to refrigerating cycle equipment was completed, and passage resistance of a refrigerating cycle can be reduced by switching piping for which a refrigerant etc. flows to bypass piping.

[0078] Moreover, the refrigerating cycle equipment by invention of claim 7 In invention of claim 6, for piping which connects said oil concentration detection equipment and said oil recovery system When the upstream and the downstream of said both equipments are equipped with piping isolation equipment, respectively and the detection concentration of the predetermined refrigerating machine oil of said oil concentration detection equipment becomes below a predetermined value Since the flow of a refrigerant etc. is separated with said piping switching unit and said oil concentration detection equipment and said oil recovery system are separated from piping by the side of said oil concentration detection equipment and said oil recovery system with a change and said piping isolation equipment to said bypass piping side In addition to the effect of the invention of claim 6, oil concentration detection equipment and an oil recovery system can be used for washing at the time of renewal of the refrigerating cycle which uses other established piping.

[0079] Moreover, the refrigerating cycle equipment by invention of claim 8 The heat souce which made piping connection of a compressor, the heat-source side heat exchanger, etc., and the interior unit which made piping connection of a flow regulator, the use side heat exchanger, etc., In refrigerating cycle equipment equipped with the 1st connecting piping and 2nd connecting piping which connect said heat souce and said interior unit Piping between the inlet ports of said compressor is equipped with an oil recovery system from the outlet of said heat-source side heat exchanger used as an evaporator, or said use side heat exchanger. By the refrigerating cycle which uses the thing of the 1st existing refrigerant and updates newly said the 1st connecting piping and said 2nd connecting piping to the thing for the 2nd refrigerant using said heat souce and said interior unit Since washing operation of said the 1st connecting piping and 2nd connecting piping is carried out using said 2nd refrigerant and its refrigerating machine oil By washing by the 2nd refrigerant which does not have to be complicated, does not have to require long duration, does not have to carry out washing by the cleaning agent of high dedication of activity cost, and is used newly, and its refrigerating machine oil An oil recovery system separates and removes the residue resulting from the 1st refrigerant which was being used before and its refrigerating machine oil, and operation of refrigerating cycle equipment is attained as it is.

[0080] Moreover, in invention of claim 8, since hydro fluorocarbon, a hydrocarbon, ammonia, or a carbon dioxide is used for the refrigerating cycle equipment by invention of claim 9 as said 2nd refrigerant, it can remove the harmful oil which is not dissolved in these refrigerants, a chlorine compound, and a sulfur compound.

[0081] Moreover, in invention of claim 8, since an ether oil, ester oil, or an alkylbenzene oil is used for the refrigerating cycle equipment by invention of claim 10 as said refrigerating machine

oil, it can remove the harmful oil which is not dissolved in these refrigerating machine oil, a chlorine compound, and a sulfur compound.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 1 of implementation of this invention.
[Drawing 2] Drawing having shown the oil concentration detection equipment of the gestalt 1 of implementation of this invention.
[Drawing 3] Drawing having shown the relation of the refractive index to the mineral oil concentration of the refrigerating machine oil for HFC of the gestalt 1 of implementation of this invention.
[Drawing 4] Drawing as for which the refrigerating machine oil for HFC of the oil concentration detection equipment of the gestalt 1 of implementation of this invention and mineral oil mixture carried out refractometry ******.
[Drawing 5] Drawing having shown the 1st oil recovery system of the gestalt 1 of implementation of this invention.
[Drawing 6] Drawing having shown the adsorption engine performance of the chlorine compound by the activated carbon of the 1st oil recovery system of the gestalt 1 of implementation of this invention.
[Drawing 7] Drawing showing the refrigerant circuit of a conditioner as an example of the refrigerating cycle equipment by the gestalt 2 of implementation of this invention.
[Drawing 8] Drawing having shown the 2nd oil recovery system of the gestalt 2 of implementation of this invention.
[Drawing 9] Drawing showing the refrigerant circuit of the conventional air conditioning.
[Description of Notations]
A Heat souce B Interior unit C The 1st connecting piping D The 2nd connecting piping, E Heat souce 1 Compressor 2 Change-over valve 3 Heat-souce side heat exchanger, 5 Flow regulator 6 Use side heat exchanger 10 Oil concentration detection equipment, 11 The 1st oil recovery system and 16 2nd oil recovery system 8 Accumulator, 11a A container, 11d Opening 11e Pore member, 11f Adsorption member (non-[made from a propylene] ****) 11g Adsorption member (activated carbon), 11i Pore member 12 Piping switching unit 13 14 Piping isolation equipment 15 Bypass piping It is the 2nd filter equipment 16f. 16g Refrigerating-machine-oil separation member.

[Translation done.]

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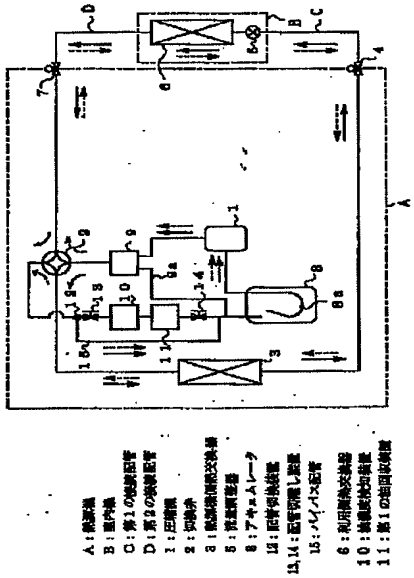
(71)出願人　000006013
三菱電機株式会社
東京都千代田区丸の内二丁目２番３号
(72)発明者　平井　康順
東京都千代田区丸の内二丁目２番３号　三菱電機株式会社内
(72)発明者　高谷　士郎
東京都千代田区丸の内二丁目２番３号　三菱電機株式会社内
(74)代理人　100102439
弁理士　宮田　金雄　（外２名）

(54)【発明の名称】　冷凍サイクル装置

(57)【要約】
【課題】　既設配管を使用してＨＦＣ冷媒を使う場合、専用の洗浄剤で煩雑で、長時間を要する配管の洗浄をしなければならなかった。
【解決手段】　冷凍サイクル装置に油回収装置を備え、ＨＦＣ冷媒とこの冷媒用の冷凍機油で洗浄運転することにより、残留物を油回収装置で分離、回収し、洗浄終了後に冷凍サイクル運転に入れる。



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【特許請求の範囲】

【請求項１】　圧縮機、熱源側熱交換器等を配管接続した熱源機と、流量調整器、利用側熱交換器等を配管接続した室内機と、前記熱源機と前記室内機とを接続する第1の接続配管及び第2の接続配管と、を備えた冷凍サイクル装置において、蒸発器として使う前記熱源側熱交換器の出口から前記圧縮機の入口の間の配管又は蒸発器として使う前記利用側熱交換器の出口から前記圧縮機の入口間の配管に、細孔部材の間に吸着部材を配置した第1のフィルター装置を有する第1の油回収装置、又は、流入配管開口部に設けた第2のフィルター装置と冷凍機油分離部材を有する第2の油回収装置、を備えたことを特徴とする冷凍サイクル装置。

【請求項２】　前記第1の油回収装置の第1のフィルター装置の吸着部材が活性炭であることを特徴とする請求項1に記載の冷凍サイクル装置。

【請求項３】　前記第1の油回収装置の第1のフィルター装置の吸着部材が繊維状吸着材であることを特徴とする請求項1に記載の冷凍サイクル装置。

【請求項４】　前記第1の油回収装置は、前記第1のフィルタ装置を収容する容器と、前記容器下部に設けた、流入配管の開口部と、前記容器上部に設けた、流出配管の開口部とを備え、前記第1のフィルター装置を前記両開口部間に備えたことを特徴とする請求項１、請求項2又は請求項3に記載の冷凍サイクル装置。

【請求項５】　前記第2の油回収装置の冷凍機油分離部材は、流体の分子の大きさが所定の大きさ以下のものを透過することを特徴とする請求項１に記載の冷凍サイクル装置。

【請求項６】　蒸発器として使う前記熱源側熱交換器の出口から前記圧縮機の入口の間の配管又は蒸発器として使う前記利用側熱交換器の出口から前記圧縮機の入口間の配管に前記油回収装置とともに設けた所定の冷凍機油の油濃度を検知する油濃度検知装置と、配管切換装置を介して接続した前記油濃度検知装置と前記油回収装置とをバイパスするバイパス配管とを備え、前記油濃度検知装置の所定の冷凍機油の検出濃度が所定値以下となった場合に、前記配管切換装置により冷媒等の流れを前記油濃度検知装置と前記油回収装置側の配管から前記バイパス配管側へ切換えることを特徴とする請求項１から請求項5のうちいずれか1項に記載の冷凍サイクル装置。

【請求項７】　前記油濃度検知装置と前記油回収装置とを接続する配管で、前記両装置の上流側と下流側にそれぞれ配管切離し装置を備え、前記油濃度検知装置の所定の冷凍機油の検出濃度が所定値以下となった場合に、前記配管切換装置により冷媒等の流れを前記油濃度検知装置と前記油回収装置側の配管から前記バイパス配管側へ切換え、かつ、前記配管切離し装置により前記油濃度検知装置と前記油回収装置とを切離すことを特徴とする請求項６に記載の冷凍サイクル装置。

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【請求項８】　圧縮機、熱源側熱交換器等を配管接続した熱源機と、流量調整器、利用側熱交換器等を配管接続した室内機と、前記熱源機と前記室内機とを接続する第1の接続配管及び第2の接続配管と、を備えた冷凍サイクル装置において、蒸発器として使う前記熱源側熱交換器の出口から前記圧縮機の入口の間の配管又は蒸発器として使う前記利用側熱交換器の出口から前記圧縮機の入口間の配管に油回収装置を備え、前記第1の接続配管及び前記第2の接続配管を既存の第1の冷媒のものを使用し、前記熱源機及び前記室内機とを新しく使う第２の冷媒用のものに更新する冷凍サイクルで、前記第2の冷媒及びその冷凍機油を用いて前記第1の接続配管及び第2の接続配管を洗浄運転することを特徴とする冷凍サイクル装置。

【請求項９】　前記第2の冷媒としてハイドロフルオロカーボン、ハイドロカーボン、アンモニア又は二酸化炭素を用いることを特徴とする請求項８に記載の冷凍サイクル装置。

【請求項１０】　前記冷凍機油としてエーテル油、エステル油又はアルキルベンゼン油を用いることを特徴とする請求項８に記載の冷凍サイクル装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、冷媒を新規に交換して使用する冷凍サイクル装置に関するものである。さらに詳しくは、熱源機と室内機を新規の冷媒用のものに更新し、熱源機と室内機とを接続する接続配管は更新せずに、冷媒を新規に交換した冷凍サイクル装置で、接続配管内の残留油分等を分離、回収し、接続配管の再使用を可能にする冷凍サイクル装置に関するものである。

【０００２】

【従来の技術】従来より一般に用いられている冷凍サイクルを備えた空気調和装置を図９に示す。図９において、Ｆは熱源機であり、圧縮機１、四方弁２、熱源機側熱交換器３、第１の操作弁４、第２の操作弁７、アキュムレータ８を内蔵している。Ｇは室内機であり、流量調整器５及び利用側熱交換器６を備えている。熱源機Ｆと室内機Ｇは、第１の接続配管Ｃ、第２の接続配管Ｄにより接続されて、冷凍サイクルを形成する。

【０００３】第１の接続配管Ｃの一端は熱源機側熱交換器３と第１の操作弁４を介して接続され、第１の接続配管Ｃの他の一端は流量調整器５と接続されている。第２の接続配管Ｄの一端は四方弁２と第２の操作弁７を介して接続され、第２の接続配管Ｄの他の一端は利用側熱交換器６と接続されている。また、アキュムレータ８のＵ字管状の流出配管の下部には返油穴８ａが設けられている。

【０００４】この空気調和装置の冷媒の流れを図９に添って説明する。図中、実線矢印が冷房運転の流れを、破線矢印が暖房運転の流れを示す。まず、冷房運転の流れ

を説明する。圧縮機１で圧縮された高温高圧のガス冷媒は四方弁２を経て、熱源機側熱交換器３へと流入し、ここで媒体と熱交換して凝縮液化する。凝縮液化した冷媒は第１の操作弁４、第１の接続配管Ｃを経て流量調整器５へ流入し、減圧されて低圧二相状態となり、利用側熱交換器６で利用媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は第２の接続配管Ｄ、第２の操作弁７、四方弁２，アキュムレータ８を経て圧縮機１へ戻る。

【０００５】次に、暖房運転の流れを説明する。圧縮機１で圧縮された高温高圧のガス冷媒は四方弁２、第２の操作弁７、第２の接続配管Ｄを経て、利用側熱交換器６へと流入し、利用媒体と熱交換して凝縮液化する。凝縮液化した冷媒は流量調整器５へ流入し、減圧されて低圧二相状態となり、第１の接続配管Ｃ、第１の操作弁４を経て、熱源機側熱交換器３で媒体と熱交換して蒸発・ガス化する。蒸発・ガス化した冷媒は四方弁２、アキュムレータ８を経て圧縮機１へ戻る。

【０００６】従来、このような空気調和装置では、冷媒としてＣＦＣ（クロロフルオロカーボン）やＨＣＦＣ（ハイドロクロロフルオロカーボン）が用いられてきたが、これらの冷媒に含まれる塩素が成層圏のオゾン層を破壊するため、生産規制対象さらには全廃対象となっている。これらの冷媒の代替として、塩素を含まないＨＦＣ（ハイドロフルオロカーボン）を用いた空気調和装置が実現化されている。

【０００７】ＣＦＣやＨＣＦＣを用いた空気調和装置が老朽化した際には、新たな空気調和装置に入れ替える必要があるが、ＣＦＣやＨＣＦＣは全廃、生産規制の対象となっているため、ＨＦＣ等の異なる冷媒を用いた空気調和装置に入れ替える必要がある。

【０００８】

【発明が解決しようとする課題】しかしながら、熱源機Ｆと室内機Ｇを接続する第1の接続配管Ｃと第2の接続配管Ｄは、熱源機Ｆや室内機Ｂと比べて利用可能期間が長く、老朽化もしないため、そのまま使用できれば簡略的に、また、低コストで空気調和装置の入れ替えが可能である。

【０００９】しかし、ＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた接続配管Ｃ、接続配管Ｄには、ＣＦＣやＨＣＦＣを用いていた空気調和装置の劣化した冷凍機油やＣＦＣやＨＣＦＣが劣化して生成した塩素化合物やＣＦＣやＨＣＦＣを用いていた空気調和装置の製造時に混入し劣化した塩素化合物や硫黄化合物等が残存している。

【００１０】接続配管Ｃ、接続配管Ｄに上記残留部が多く残存した状態で、例えばＨＦＣを用いた空気調和装置を接続し、接続配管Ｃ、接続配管Ｄを使用すると、残存している劣化した冷凍機油や塩素化合物や硫黄化合物等がＨＦＣを用いた空気調和装置用の冷凍機油に混入し、

ＨＦＣを用いた空気調和装置用の冷凍機油の劣化が促進され、ＨＦＣを用いた空気調和装置の信頼性上好ましくない。

【００１１】このため、従来はＣＦＣやＨＣＦＣを用いた空気調和装置で使用していた第１の接続配管Ｃと第２の接続配管ＤにＨＦＣを用いた空気調和装置を接続し、接続配管Ｃ、接続配管Ｄを使用する場合には、接続配管Ｃ、接続配管Ｄを専用の洗浄剤で洗浄する必要があった。これらの洗浄作業は非常に煩雑であり、長時間を要するとともに、洗浄作業にかかるコストが高いという問題点があった。

【００１２】この発明は、ＣＦＣ、ＨＣＦＣ系冷媒を用いた冷凍サイクル装置で使用した接続配管を、煩雑で、長時間を要し、作業コストが高い、専用の洗浄剤による洗浄を行わずに再使用できる、ＨＦＣ等の冷媒を使用した冷凍サイクル装置を提供するものである。

【００１３】

【課題を解決するための手段】本願の請求項１の発明による冷凍サイクル装置は、圧縮機、熱源側熱交換器等を配管接続した熱源機と、流量調整器、利用側熱交換器等を配管接続した室内機と、前記熱源機と前記室内機とを接続する第1の接続配管及び第2の接続配管と、を備えた冷凍サイクル装置において、蒸発器として使う前記熱源側熱交換器の出口から前記圧縮機の入口の間の配管又は蒸発器として使う前記利用側熱交換器の出口から前記圧縮機の入口間の配管に、細孔部材の間に吸着部材を配置した第1のフィルター装置を有する第1の油回収装置、又は、流入配管開口部に設けた第2のフィルター装置と冷凍機油分離部材を有する第2の油回収装置、を備えたものである。

【００１４】また、請求項２の発明による冷凍サイクル装置は、請求項1の発明において、前記第1の油回収装置の第1のフィルター装置の吸着部材が活性炭としたものである。

【００１５】また、請求項３の発明による冷凍サイクル装置は、請求項1の発明において、前記第1の油回収装置の第1のフィルター装置の吸着部材が繊維状吸着材であるものである。

【００１６】また、請求項４の発明による冷凍サイクル装置は、請求項１、請求項2又は請求項3の発明において、前記第1の油回収装置は、前記第1のフィルタ装置を収容する容器と、前記容器下部に設けた、流入配管の開口部と、前記容器上部に設けた、流出配管の開口部とを備え、前記第1のフィルター装置を前記両開口部間に備えたものである。

【００１７】また、請求項５の発明による冷凍サイクル装置は、請求項１の発明において、前記第2の油回収装置の冷凍機油分離部材は、流体の分子の大きさが所定の大きさ以下のものを透過するものである。

【００１８】また、請求項６の発明による冷凍サイクル

装置は、請求項１から請求項５のいずれか1項の発明において、蒸発器として使う前記熱源側熱交換器の出口から前記圧縮機の入口の間の配管又は蒸発器として使う前記利用側熱交換器の出口から前記圧縮機の入口間の配管に前記油回収装置とともに設けた所定の冷凍機油の油濃度を検知する油濃度検知装置と、配管切換装置を介して接続した前記油濃度検知装置と前記油回収装置とをバイパスするバイパス配管とを備え、前記油濃度検知装置の所定の冷凍機油の検出濃度が所定値以下となった場合に、前記配管切換装置により冷媒等の流れを前記油濃度検知装置と前記油回収装置側の配管から前記バイパス配管側へ切換えるものである。

【００１９】また、請求項７の発明による冷凍サイクル装置は、請求項６の発明において、前記油濃度検知装置と前記油回収装置とを接続する配管で、前記両装置の上流側と下流側にそれぞれ配管切離し装置を備え、前記油濃度検知装置の所定の冷凍機油の検出濃度が所定値以下となった場合に、前記配管切換装置により冷媒等の流れを前記油濃度検知装置と前記油回収装置側の配管から前記バイパス配管側へ切換え、かつ、前記配管切離し装置により前記油濃度検知装置と前記油回収装置とを切離すものである。

【００２０】また、請求項８の発明による冷凍サイクル装置は、圧縮機、熱源側熱交換器等を配管接続した熱源機と、流量調整器、利用側熱交換器等を配管接続した室内機と、前記熱源機と前記室内機とを接続する第1の接続配管及び第2の接続配管と、を備えた冷凍サイクル装置において、蒸発器として使う前記熱源側熱交換器の出口から前記圧縮機の入口の間の配管又は蒸発器として使う前記利用側熱交換器の出口から前記圧縮機の入口間の配管に油回収装置を備え、前記第1の接続配管及び前記第2の接続配管を既存の第1の冷媒のものを使用し、前記熱源機及び前記室内機とを新しく使う第２の冷媒用のものに更新する冷凍サイクルで、前記第2の冷媒及びその冷凍機油を用いて前記第1の接続配管及び第2の接続配管を洗浄運転するものである。

【００２１】また、請求項９の発明による冷凍サイクル装置は、請求項８の発明において、前記第2の冷媒としてハイドロフルオロカーボン、ハイドロカーボン、アンモニア又は二酸化炭素を用いるものである。

【００２２】また、請求項１０の発明による冷凍サイクル装置は、請求項８の発明において、前記冷凍機油としてエーテル油、エステル油又はアルキルベンゼン油を用いるものである。

【００２３】

【発明の実施の形態】以下、図面を参照してこの発明の実施の形態について説明する。なお、各図中、同一又は相当する部分には、同一符号を付して説明を省略または簡略化する。実施の形態１．図１は、この発明の実施の形態１による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図である。図１において、Ａは熱源機であり、圧縮機１、冷媒流れを切換える切換弁である四方弁２、熱源機側熱交換器３、第１の操作弁４、第２の操作弁７、アキュムレータ８、油分離器９、油濃度検知装置１０、第1の油回収装置１１、配管切換装置である配管切換弁１２、第３の操作弁１３、第４の操作弁１４、バイパス配管１５を内蔵している。

【００２４】油分離器９は、圧縮機１の吐出配管に設けられ、圧縮機１から冷媒とともに吐出される冷凍機油を分離する。油濃度検知装置１０と第1の油回収装置１１とは四方弁２とアキュムレータ８の間に接続され、油濃度検知装置１０の一端は第３の操作弁１３に接続され、他の一端は第1の油回収装置１１に接続されている。また、第1の油回収装置１１の一端は油検知装置１０に、他の一端は第４の操作弁１４に接続されている。９ａは、一端が油分離器９の底部に接続され、他端が第1の油分離装置１１の出口より下流側に接続されたバイパス路である。配管切換弁１２は、四方弁２より流入する冷媒および冷凍機油を第３の操作弁１３、油濃度検知装置１０、第1の油回収装置１１、第４の操作弁１４を経てアキュムレータ８へ流入する流路と、配管切換弁１２、バイパス配管１５を経てアキュムレータ８へ流入する流路と切り替えるために設けられたものである。また、アキュムレータ８のＵ字管状の流出配管の下部には返油穴８ａが設けられている。Ｂは室内機であり、流量調整器５（あるいは流量調整弁５）、及び利用側熱交換器６を備えている。

【００２５】Ｃは、第１の接続配管であり、その一端は熱源機側熱交換器３と第１の操作弁４を介して接続され、他の一端は流量調整器５と接続されている。Ｄは、第２の接続配管であり、その一端は四方弁２と第２の操作弁７を介して接続され、他の一端は利用側熱交換器６と接続されている。熱源機Ａと室内機Ｂは離れた場所に設置され、第１の接続配管Ｃ、第２の接続配管Ｄにより接続されていて、冷凍サイクルを形成する。なお、この空気調和装置は冷媒としてＨＦＣを使い、四方切換弁２を切換えることにより、利用側熱交換器6を蒸発器として使用する冷房運転、また、凝縮器として使用する暖房運転を行うものであるが、この動作は一般的であるので説明を省略する。

【００２６】次に、ＣＦＣやＨＣＦＣを使った空気調和装置が老朽化等によりＨＦＣを使う空気調和装置に更新する場合に、熱源機と室内機とはＨＦＣ用のものに更新し、熱源機Ａと室内機Ｂ間の接続配管は専用の洗浄剤による洗浄を行わずに再使用する、この実施の形態の空気調和装置の交換手順を示す。ＣＦＣやＨＣＦＣを使った空気調和装置に使用していたＣＦＣまたはＨＣＦＣを回収し、ＣＦＣやＨＣＦＣを使った空気調和装置に使用していた熱源機と室内機を図１に示すこの実施の形態にける熱源機Ａと室内機Ｂに交換する。第１の接続配管Ｃと

第２の接続配管ＤはＣＦＣやＨＣＦＣを使った空気調和装置のものを再利用する。熱源機Ａには予めＨＦＣが充填されているので、第１の操作弁４と第２の操作弁７は閉じたまま、室内機Ｂ、第１の接続配管Ｃ、第２の接続配管Ｄを接続状態で真空引きし、その後、第１の操作弁４と第２の操作弁７の開弁とＨＦＣの追加充填を実施する。その後、この実施の形態の空気調和装置を運転することにより、ＣＦＣやＨＣＦＣを使った空気調和装置で使用した第1、第2の接続配管Ｃ、Ｄの洗浄運転を実施する。

【００２７】次に、この実施の形態の空気調和装置を運転することによる、ＣＦＣやＨＣＦＣを使った空気調和装置で使用した第1、第2の接続配管Ｃ、Ｄの洗浄運転の内容を図１に添って説明する。図中実線矢印が洗浄パターン１の流れを、破線矢印が洗浄パターン２の流れを示す。まず、洗浄パターン１について説明する。圧縮機１で圧縮された高温高圧のＨＦＣのガス冷媒はエステル油等のＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。

【００２８】ここで、ＨＦＣ用冷凍機油の大半は分離され、ＨＦＣのガス冷媒および若干のＨＦＣ用冷凍機油が、四方弁２を経て、熱源機側熱交換器３へと流入し、ここで空気・水などの媒体と熱交換して凝縮し液化する。液化した冷媒は、第１の操作弁４を経て第１の接続配管Ｃに流入する。ＨＦＣの液冷媒およびＨＦＣ用冷凍機油が第１の接続配管Ｃを流れるときに、第１の接続配管Ｃに残留している劣化した鉱油等のＣＦＣやＨＣＦＣ用冷凍機油および塩素化合物や硫黄化合物等（以後、残留物と称す）の一部は、流動するＨＦＣの液冷媒およびＨＦＣ用冷凍機油に溶解し、共に流れ、また一部はＨＦＣの液冷媒およびＨＦＣ用冷凍機油の流動によるせん断力により、共に流れ、流量調整器５へ流入する。ここでＨＦＣの液冷媒は低圧まで減圧されて低圧の気体と液体の二相状態となり、利用側熱交換器６で空気などの利用側媒体と熱交換して蒸発し、ガス化するが、上記残留物の一部は、流動するＨＦＣの液冷媒およびＨＦＣ用冷凍機油部に溶解し、共に流れ、また一部はニ相状態またはガス状態のＨＦＣ冷媒およびＨＦＣ用冷凍機油の流動によるせん断力により、共に流れる。

【００２９】蒸発し、ガス化したＨＦＣ冷媒およびＨＦＣ用冷凍機油は、第１の接続配管Ｃに残留していた残留物と共に第２の接続配管Ｄに流入する。第２の接続配管Ｄの残留物の一部は、ニ相状態のＨＦＣ冷媒やＨＦＣ用冷凍機油に溶解し、共に流れ、また一部は、ニ相状態またはガス状態のＨＦＣ冷媒やＨＦＣ用冷凍機油の流動によるせん断力により、共に流れ、第１の接続配管Ｃ内の残留物と共に第２の操作弁７さらに四方弁２、配管切換弁１２、第３の操作弁１３、油濃度検知装置１０を経て第1の油回収装置１１へ流入する。

【００３０】油濃度検知装置１０では、ＨＦＣ冷媒やＨＦＣ用冷凍機油と共に流れていた特定の油分の濃度、例えばＣＦＣやＨＣＦＣを使った空気調和装置で使用され、接続配管中に残留していた鉱油等の冷凍機油の濃度を検知でき、この実施の形態の空気調和装置を使用した、ＣＦＣやＨＣＦＣを使った空気調和装置で使用した接続配管の洗浄運転において、接続配管に残留している鉱油等の濃度を逐次に知ることができ、その濃度の変化が洗浄運転における目標値に達した時点で、即ち、鉱油等の有害な所定の冷凍機油の検出濃度が所定値以下となった場合に、洗浄時間を完了することができ、洗浄運転の効率を高めることができる。また、第1の油回収装置１１では、第1の接続配管Ｃおよび第2の接続配管Ｄより流入した残留物および残留物を溶解したＨＦＣ用冷凍機油は、ＨＦＣのガス冷媒と分離され、回収され、ＣＦＣやＨＣＦＣを使った空気調和装置で使用されていた接続配管中に残留していた有害な残留物は回収される。その後ＨＦＣのガス冷媒は、第４の操作弁１４を経てアキュムレータ８へと流入し、圧縮機１へ戻る。

【００３１】所定の洗浄運転が終了すると、配管切換弁１２を油濃度検知装置１０、第1の油回収装置１１を経る回路からバイパス配管１５を経る回路へと切替え、通常の空調運転が可能となる。なお、油濃度検知装置１０の検知方法、第1の油回収装置１１の回収方法については、後に説明する。

【００３２】次に洗浄パターン２の流れを説明する。圧縮機１で圧縮された高温高圧のＨＦＣのガス冷媒はＨＦＣ用冷凍機油と共に圧縮機１を吐出され、油分離器９へ流入する。ここで、ＨＦＣ用冷凍機油の大半は分離され、ＨＦＣのガス冷媒および若干のＨＦＣ用冷凍機油が、四方弁２、第２の操作弁７を経て第２の接続配管Ｄに流入する。

【００３３】ＨＦＣのガス冷媒およびＨＦＣ用冷凍機油が第２の接続配管Ｄを流れるときに、第２の接続配管Ｄに残留している残留物の一部は、流動するＨＦＣ用冷凍機油に溶解し、共に流れ、また一部はＨＦＣのガス冷媒およびＨＦＣ用冷凍機油の流動によるせん断力により、共に流れ、利用側熱交換器６へと流入する。ここでＨＦＣのガス冷媒は利用媒体と熱交換して凝縮・液化し、凝縮・液化した冷媒は、流量調整器５へ流入し、ここで低圧まで減圧されて低圧の気体と液体の二相状態となり、第１の接続配管Ｃに流入する。

【００３４】接続配管Ｃの残留物の一部は、気体と液体のニ相状態となったＨＦＣの液冷媒およびＨＦＣ用冷凍機油に溶解し、共に流れ、また一部は、ニ相状態のＨＦＣ冷媒やＨＦＣ用冷凍機油の流動によるせん断力により、共に流れ、接続配管Ｄの残留物と共に第１の操作弁４を経て、熱源機側熱交換器３へと運ばれる。ここで、気液二相状態の冷媒は、空気・水などの媒体と熱交換して蒸発し、ガス化する。ガス化したＨＦＣ冷媒は、ＨＦＣ用冷凍機油および残留物と共に四方弁２、配管切換弁

１２、第３の操作弁１３、油濃度検知装置１０を経て第1の油回収装置１１に流入する。

【００３５】油濃度検知装置１０では、前記洗浄パターン１の洗浄運転と同様に、ＨＦＣ冷媒やＨＦＣ用冷凍機油と共に流れていた特定の油分の濃度を検知でき、接続配管に残留している鉱油等の濃度を逐次に知ることができ、その濃度が洗浄運転における目標値に達した時点で洗浄時間を完了することができ、洗浄運転の効率を高めることができる。また、第1の油回収装置１１では、第2の接続配管Ｄおよび第1の接続配管Ｃより流入した残留物および残留物を溶解したＨＦＣ用冷凍機油は、ガス冷媒と分離され、回収され、ＣＦＣやＨＣＦＣを使った空気調和装置で使用されていた接続配管中に残留していた有害な残留物は回収される。その後ＨＦＣのガス冷媒は、第４の操作弁１４を経てアキュムレータ８へと流入し、圧縮機１へ戻る。

【００３６】所定の洗浄運転が終了すると、配管切換弁１２を第1の油回収装置１１を経る回路からバイパス配管１５を経る回路へと切替え、通常の空調運転が可能となる。

【００３７】なお、上記のように洗浄パターン１では、第1の接続配管Ｃは高圧液冷媒、第2の接続配管Ｄは低圧ガス冷媒が流れ、洗浄パターン２では、第1の接続配管Ｃは低温低圧の気液二相冷媒、第2の接続配管Ｄは高温高圧ガス冷媒が流れ、洗浄パターンにより洗浄効果が変化するが、洗浄する接続配管の状況に応じて、洗浄効果の高い洗浄パターンを選択することができ、組み合わせることもできる。即ち、洗浄運転初期では、接続配管に鉱油が多く存在しており、流速の早いガス冷媒で洗浄運転する方が洗浄効果が高い（押し流すことができる）、また、鉱油が微量でも二相で洗浄すると、せん断力により配管から剥離した鉱油は比重が冷媒より軽く、液冷媒の上に浮上し、運ばれていくため、良く洗浄できる、等により洗浄パターンの選択、組合せを考慮できる。

【００３８】なお、洗浄運転中、油分離器９より第2の接続配管Ｄに流出したＨＦＣ用冷凍機油が第1の油回収装置１１で分離、回収されるため、圧縮機１に充填されていたＨＦＣ用冷凍機油が時間の経過と共に減少するが、洗浄運転時間内に減少する量のＨＦＣ用冷凍機油を洗浄運転開始時より追加充填しておくと問題ない。また、所定の洗浄運転が終了した後に、配管切換弁１２を油濃度検知装置１０および第1の油回収装置１１を経る回路からバイパス配管１５を経る回路へと切替えることにより、配管切離し装置である操作弁１３および操作弁１４より油濃度検知装置１０および第1の油回収装置１１を取り外すことができ、取り外した油濃度検知装置１０および第1の油回収装置１１はこの実施の形態の他製品に再利用可能で、低コストでこの実施の形態の油濃度検知装置１０および第1の油回収装置１１を提供することができる。

【００３９】次に、油濃度検知装置１０について説明する。図２は油濃度検知装置１０の例を図示したものである。１０ａは円筒状の容器、１０ｂは容器１０ａの上部に設けられた流入配管で先端部には金網状の金属製のフィルタ１０ｆが設けられている。１０ｃは容器１０ａの上部に設けられた流出配管、１０ｄは容器１０ａの下部に設けられた配管で、先端部にはバルブ１０ｅが設けられている。１０ｇおよび１０ｈは可視光を発する光源１０ｉからの光を透過する石英ガラス等からなる小窓である。また１０ｊは光源１０ｉからの可視光の透過強度を検知する検知器である。

【００４０】流入配管１０ｂより流入したＨＦＣのガス冷媒、ＨＦＣ用冷凍機油、残留物は、フィルタ１０ｆに到達し、ここでＨＦＣ用冷凍機油および残留物に含まれる鉱油等の冷凍機油は泡状もしくは油滴となりフィルタ１０ｆを通過し、容器１０ａの底部に落下する。また、フィルタ１０ｆを通過したＨＦＣのガス冷媒は、ＨＦＣ用冷凍機油および残留物に含まれる鉱油等の冷凍機油および残留物の一部と共に流出配管１０ｃより流出する。

【００４１】本実施の形態のＨＦＣ冷媒を使用した空気調和装置に使用される代表的冷凍機油であるエステル油は、波長が５４０ｎｍの可視光に対する屈折率は１．４５４であり、また、ＣＦＣおよびＨＣＦＣ冷媒を使用した空気調和装置で使用されていた接続配管Ｃおよび接続配管Ｄに残留している油分の主成分はＣＦＣおよびＨＣＦＣ冷媒を使用した空気調和装置で使用されていた冷凍機油であり、その代表的冷凍機油である鉱油は、波長が５４０ｎｍの可視光に対する屈折率は１．４９８である。図３はエステル油中の鉱油濃度とその混合液の、波長が５４０ｎｍの可視光に対する屈折率の関係である。図に示した関係より、エステル油と鉱油の混合液において、その混合液の波長が５４０ｎｍの可視光に対する屈折率を測定することにより、エステル油と鉱油の濃度を知ることができる。ここでは、光源から発する可視光の波長が５４０ｎｍの場合について示したが、光源から発するいずれの波長の可視光についても同様の関係が成り立つ。

【００４２】したがって、光源１０ｉより特定の波長の可視光を発し、小窓１０ｇ、容器１０ａ内に蓄積されたエステル油と鉱油の混合液、小窓１０ｈを経て検出器１０ｊにて光の透過強度を検知し、エステル油と鉱油の混合液の屈折率を計算することにより、容器１０ａ中のエステル油および鉱油の濃度を知ることができる。

【００４３】容器１０ａ中に蓄積されたエステル油と鉱油の混合液の光の透過強度からその屈折率を計算する方法を図４に基づいて説明する。図４において、１０ｉは特定の波長の可視光を発する光源、１０ｇはその波長に対する屈折率がn_1の小窓、１０ｈはその波長に対する屈折率がn_1の小窓、１０ｊは可視光１０ｉの強度を検知する検知器で、n_0は空気中のその波長に対する屈折

率である。また、１０ｋ、１０ｌ、１０ｍ、１０ｎは空気と小窓１０ｇとの界面１０ｋ、小窓１０ｇとＨＦＣ用冷凍機油と鉱油の混合液との界面１０１、ＨＦＣ用冷凍機油と鉱油の混合物と小窓１０ｈとの界面１０ｍ、小窓１０ｈと空気との界面１０ｎである。

【００４４】一般的に、ある波長の光に対する吸収が十分小さく、その波長の光に対する屈折率がn_a、n_bと異なる媒体中に可視光を通すと、透過した光の透過率Ｔは以下のようになる。

$T=(4n_an_b)/(n_a+n_b)^2$

【００４５】したがって、図４に示すように光源１０ｉからある波長の光を発すると界面１０ｋ、界面１０１、界面１０ｍ、界面１０ｎでその波長の光の透過強度が上式にしたがって減少し、検知器１０ｊにて検出されるその波長の光の透過率Ｔは以下のようになる。

$T=\{(4n_0n_1)/(n_0+n_1)^2\}^2\times\{(4n_1n_2)/(n_1+n_2)^2\}^2$

【００４６】ここで、n_0は、その波長の光に対する空気の屈折率であるため既知の値で、n_1はその波長の光に対する屈折率の既知の材料の小窓を使用することにより、エステル油と鉱油の混合液の屈折率n_2を求めることができる。

【００４７】このように、光源１０ｉより特定の波長の光を発し、検知器１０ｊによりその波長の光の透過率を検知し、エステル油と鉱油の混合液の屈折率n_2を求めることが可能で、図３に示した様なエステル油中の鉱油濃度と屈折率の関係より、容器１０ａに蓄積した油分中の鉱油の濃度を知ることができる。

【００４８】このように、ＨＦＣ用冷凍機油と鉱油の混合液中に特定の波長の光を通し、混合液の透過率を測定し、屈折率を計算することにより、鉱油等の油の濃度を検知することができる。ここでは、光源から発する光が可視光である場合について説明したが、光源から発する光は赤外線、紫外線等のいずれの光であっても良く、それに対応した検知器を用いることにより、同様に鉱油等の油の濃度を検知することができる。また、ここではエステル油と鉱油の混合液中の鉱油濃度の検知手段を示したが、他の成分の油の混合液についても同様に混合油分の濃度が検知可能である。

【００４９】また、バルブ１０ｅより容器１０ａ内に蓄積したエステル油や鉱油を排出することができ、これらの蓄積したエステル油と鉱油を排出した後に、さらに回収されるエステル油および鉱油の濃度を検知することができ、一定時間の洗浄運転の後に回収される鉱油濃度を高精度で検知することができ、鉱油の濃度が目標値以下になっていれば洗浄運転を完了することができ、洗浄運転の時間の短縮化が図れる。

【００５０】次に第1の油回収装置１１について説明する。図５は第1の油回収装置１１の例を図示したものである。１１ａは円筒状の容器、１１ｂは流出配管、１１ｃは容器１１ａの下部に設けられた流入配管で、先端部には下方向に流入物が噴射されるような小穴１１ｄが設けられている。１１ｅおよび１１ｉは細孔部材であるフィルタであり、焼結金属で形成され、フィルタ１１ｅおよび１１ｉの間隙は１０ミクロン程度で、これ以上の大きさの固体粒子はフィルタ１１ｅおよび１１ｉを通過できない。１１ｆはポリプロピレン製繊維であり、１１ｇは活性炭であり、これらが吸着部材である。１１ｈは活性炭の流出を防ぐためのフィルタであり、ガラスウールで構成されている。細孔部材１１ｅ、１１ｉ、吸着部材１１ｆ、１１ｇ及びフィルタ１１ｈで第1のフィルター装置を構成するが、少なくとも細孔部材１１ｅ、１１ｉ間に吸着部材１１ｆ、１１ｇの一方が配置されておれば第1のフィルターの役割ははたす。

【００５１】流入配管１１ｃより流入したＨＦＣ冷媒、ＨＦＣ用冷凍機油、接続配管中の残留物は小穴１１ｄより容器１１ａ下方に向かって噴射されるように流入する。容器１１ａに吹き付けられたＨＦＣ用冷凍機油、鉱油等の接続配管中の残留物の油滴は容器１１ａの底部に滞留し、ガス冷媒と分離される。ここで、接続配管中の残留物に含まれる固形異物の一部は、ＨＦＣ用冷凍機油、鉱油等とともに沈殿する。

【００５２】容器１１ａの底部に沈殿しきれなかったＨＦＣ用冷凍機油、鉱油等の残留物はＨＦＣとともに容器１１ａ内を上昇し、フィルタ１１ｅに達する。ここでは、大きさが１０ミクロン以上の粒子は通過できない。フィルタ１１ｅを通過したＨＦＣ、ＨＦＣ用冷凍機油、接続配管Ｃ、Ｄ中の残留物は吸着材１１ｆに達する。

【００５３】ポリプロピレン製繊維である吸着部材１１ｆは親油性であり、ＨＦＣ用冷凍機油、接続配管Ｃ、Ｄ中の残留物に含まれる鉱油等の油分を吸着する。また、鉱油等の油中に溶解している塩素化合物及び硫黄化合物を除去できる。さらに、接続配管中の残留物に含まれる固形異物の一部も吸着部材１１ｆにより吸着される。

【００５４】吸着部材１１ｆを透過したＨＦＣおよびＨＦＣ用冷凍機油、鉱油等は活性炭１１ｇへ達する。活性炭１１ｆは広大な比表面積および細孔構造を有し、ＨＦＣ用冷凍機油、鉱油等を吸着する。活性炭１１ｇは極性分子よりもむしろ非極性分子を吸着する性質を有しており、非極性である鉱油は、より選択的に吸着される。

【００５５】さらに活性炭１１ｇは接続配管中に残留している有害な塩素化合物や硫黄化合物を吸着する。図６は活性炭による塩素化合物の吸着性能を示したものであり、縦軸は単位活性炭当たりの塩素化合物吸着量を、横軸は塩素化合物の濃度を示している。ここでは、活性炭の塩素化合物に対する吸着特性を示したが、硫黄化合物についても同様の吸着性能を有している。このように活性炭１１ｇを用いることにより、有害な油分、塩素化合物、硫黄化合物をを吸着させることができ、効率良く有害成分を除去できる。

【００５６】活性炭１１ｇを透過したＨＦＣはフィルタ１１ｈ、フィルタ１１ｉを経て容器１１ａ内上部に達し、流出配管１１ｂより流出する。なお、油回収装置として、前記の第1の油回収装置の代わりに後述の（実施の形態2に記載）第2の油回収装置を使っても、ほぼ同様な効果が得られる。即ち、第1の油回収装置と第2の油回収装置とは相互に交換してもよい。

【００５７】この第1の油回収装置では吸着部材１１ｆとして繊維状吸着材であるポリプロピレン製繊維を用いたが、吸着部材としてその他にセルロース繊維、ナイロン繊維、ポリエステル繊維、グラスウール等の繊維状吸着材を用いても同様の効果が期待できる。

【００５８】さらに、第１の接続配管Ｃおよび第２の接続配管Ｄに残存している残留物を効率良く洗浄、回収するために、この実施の形態の冷媒回路内に洗浄効果を有する成分を添加し、洗浄運転を実施してもよく、そのような場合においては、添加した成分は吸着材１１ｆおよび活性炭１１ｇにより分離、回収可能である。

【００５９】以上のように、油濃度検知装置１０、第1の油回収装置１１を冷媒回路内に設置することにより、第１の接続配管Ｃ、第２の接続配管Ｄに残留している有害な油分、塩素化合物、硫黄化合物等を分離、回収でき、冷媒回路内の特定の油分濃度が検知でき、ＣＦＣ、ＨＣＦＣ系冷媒を用いた冷凍サイクル装置で使用した第1、第2の接続配管Ｃ、Ｄを、煩雑で、長時間を要し、作業コストが高い、専用の洗浄液による洗浄を行わずに使用できる、ＨＦＣ等の異なる冷媒を使用した冷凍サイクル装置を提供するものである。なお、第1の油回収装置は、容器内の吸着部材上部及び下部に空間を設け、動圧が吸着部材にかからない構造としている。吸着部材（特に活性炭）は油等との接触時間が長いほど、吸着し易いので、流入部分に空間を設けて、流速を落として（安定させてから）吸着部材に流入するようにしている。円筒容器を用いた場合、径が大きいほど流速が遅くなり、吸着効率が良くなる。また、流入配管１１ｃを容器内部まで入れて、開口部１１ｄを下向きに設け、流入した油滴を容器内壁に当てることにより、油滴を冷媒から分離することができる。また、吸着部材より下部で、容器下部に流入配管開口部を設け、吸着部材より上部で、容器上部に流出配管の開口部を設けることにより、容器下部に油を溜める構造としている。そこで、容器下部の流入管開口部から出た油分は容器の下部に溜り、冷媒ガスとともに容器内を上昇する鉱油等が減少でき、過剰な吸着部材を必要としない。また、この実施の形態では、油濃度検知装置10と第1の油回収装置１１とをこの順に直列に接続した例を示したが、第3の操作弁１３と第4の操作弁１４間で並列に配管接続したり、油濃度検知装置10をバイパスする配管を介して、第1の油回収装置１１を接続して、油濃度検知装置10は、開閉弁で油濃度を検知する時のみ冷媒等を流すようにしてもよい。

【００６０】この実施の形態では、第1の油回収装置１１の設置場所については、前記のように冷媒流れを切換える四方弁２とアキュムレータ８入口との間の配管が最も望ましいが、その他に、四方弁2と圧縮機1の入口の間の配管、さらに蒸発器として使う熱源側熱交換器３の出口から圧縮機1の入口の間の配管又は蒸発器として使う利用側熱交換器６の出口から圧縮機1の入口の間の配管（但し、第2の接続配管は当然除く）であってもよく、要するに冷媒状態がガス状態を主とする場所であればよい。第1の油回収装置１１の設置場所を蒸発器として使う熱源側熱交換器３の出口から圧縮機1の入口の間の配管とした場合は、洗浄運転は、洗浄パターン２から行い、設置場所を蒸発器として使う利用側熱交換器６の出口から圧縮機1の入口の間の配管とした場合は、洗浄パターン１から行うことにより残留物を含んだ冷媒は第1の油回収装置１１を経由してから圧縮機１へ戻るようにでき、圧縮機への悪影響はなくすことができる（本第1の油回収装置１１の設置場所については、後述の実施の形態2の第2の油回収装置１６についても同様である）。また、この実施の形態では、切換弁である四方弁２により冷媒流れを切換え、利用側熱交換器６を蒸発器とする冷房運転と凝縮器とする暖房運転（熱源機側熱交換器３を蒸発器とする）の両方が可能な冷凍サイクルについて記載したが、例えば、前記の切換弁なしに、利用側熱交換器６を蒸発器としてのみ使用する冷房専用の冷凍サイクル等にも本技術は適用できる。この場合は、洗浄運転は、当然前記冷凍サイクルの冷媒流れと一致した洗浄パターン１又は２となる（本件も後述の実施の形態２においても同様である）。また、室内機Ｂが１台接続された例について説明したが、室内機Ｂが並列または直列に複数台接続された空気調和装置でも同様の効果を奏することはいうまでもない。また、熱源機側熱交換器３と直列または並列に氷蓄熱槽や水蓄熱槽が設置されていても同様の効果を奏することは明らかである。また、熱源機Ａが複数台並列に接続された空気調和装置においても同様の効果を奏することは明らかである。また、この実施の形態では空気調和装置について説明したが、冷凍機やチラーについても同様の効果が得られる。

【００６１】特に、冷凍機油としてエーテル油またはエステル油またはアルキルベンゼン油を用いた場合、これらの冷凍機油には既存の第1の冷媒であるＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた既存の第1の接続配管Ｃ、第2の接続配管Ｄに残留する、ＣＦＣやＨＣＦＣを用いていた空気調和装置の冷凍機油である鉱油が溶解しないため、ＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた第1の接続配管Ｃ、第2の接続配管Ｄを使用する場合、空気調和装置の冷凍サイクルにおいて、残留物である鉱油が分離し、冷凍サイクルに悪影響を及ぼす可能性があり、十分な洗浄が必要であり、この実施の形態の空気調和装置による洗浄運転は特に有

効である。また、冷媒として新しく使う第2の冷媒であるハイドロフルオロカーボンまたはハイドロカーボンまたはアンモニアまたは二酸化炭素を用いた空気調和装置においては、ＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた第1の接続配管Ｃ、第2の接続配管Ｄに残留する鉱油や塩素系化合物や硫黄系化合物がハイドロフルオロカーボンまたはハイドロカーボンまたはアンモニアまたは二酸化炭素の冷媒に溶解しにくく、冷凍サイクルに悪影響を及ぼす可能性があり、十分な洗浄が必要であり、この実施の形態の空気調和装置による、新しく使用する冷媒及びその冷凍機油による洗浄運転は特に有効である。

【００６２】実施の形態２．図７は、この発明の実施の形態２による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図である。図７において、符号Ｂ～Ｄ、１～９、１２～１５及び９ａは、実施の形態１と同様のものであるため、詳細な説明を省略する。図７において、Ｅは熱源機、１６は第2の油回収装置であり、第2の油回収装置１６は、四方弁２とアキュムレータ８の間にそれぞれ第３の操作弁１３、第４の操作弁１４を介して設けられている。

【００６３】また、図中の実線矢印が洗浄パターン１の流れを、破線矢印が洗浄パターン２の流れを示し、実施の形態１と同様の洗浄パターンであるため、詳細な説明を省略する。

【００６４】第2の油回収装置１６について説明する。図８は第2の油回収装置１６を図示したものである。１６ａは円筒状の容器、１６ｂは容器１６ａの上部に設けられた流入配管で先端部には第2のフィルター装置である金網状の金属製フィルタ１６ｆが設けられている。１６ｃは容器１６ａの上部に設けられた流出配管、１６ｄは容器１６ａの下部に設けられた配管で、先端部にはバルブ１６ｅが設けられている。１６ｇは容器１６ａ内面に設置された冷凍機油分離部材であるゴム分離膜である。

【００６５】流入配管１６ｂより流入したＨＦＣガス冷媒、ＨＦＣ用冷凍機油、残留物は、フィルタ１６ｆに到達し、ここでＨＦＣ用冷凍機油および鉱油は泡状もしくは油滴となりフィルタ１６ｆを通過し、ゴム分離膜１６ｇに至る。

【００６６】ゴム分離膜は、分子の大きさが一定の大きさ以下の液体を透過する。鉱油の主成分の分子量はおよそ２００～６００であり、代表的ＨＦＣ用冷凍機油エステル油の主成分の分子量はおよそ７００～８００であるため、分子量６５０以下の成分が通過できるゴム分離膜１１ｇを使用することにより、鉱油のみがゴム分離膜１１ｇを通過でき容器１６の底部に蓄積される。ゴム分離膜１１ｇを通過できないエステル油の一部はＨＦＣガス冷媒とともに流出配管１６ｃより流出し、一部はゴム分離膜１６ｇ上に滞留する。

【００６７】このようにして、容器１６ａの内部でＨＦＣ冷媒、ＨＦＣ用冷凍機油と鉱油は分離される。また、容器１６ａ底部に蓄積された鉱油は配管１６ｄを経て、バルブ１６ｅを開けることにより回収することができる。

【００６８】このように、ゴム分離膜を選択することにより、分子の大きさが一定の大きさ以下の鉱油等を選択的に分離、回収できる。

【００６９】以上のように、第2の油回収装置１６を冷媒回路内に設置することにより、第１の接続配管Ｃ、第２の接続配管Ｄに残留している有害な鉱油等の油分を効率よく分離、回収でき、ＣＦＣ、ＨＣＦＣ系冷媒を用いた冷凍サイクル装置で使用した接続配管を、煩雑で、長時間を要し、作業コストが高い、専用の洗浄液による洗浄を行わずに使用できる、ＨＦＣ等の異なる冷媒を使用した冷凍サイクル装置を提供するものである。

【００７０】この実施の形態では、油回収装置として第2の油回収装置の例を示したが、前記実施の形態1で記載した第1の油回収装置を第2の油回収装置の代わりに使用しても、また、前記の実施の形態1において第1の油回収装置の代わりに第2の油回収装置を使ってもよい。また、この実施の形態では、室内機Ｂが１台接続された例について説明したが、室内機Ｂが並列または直列に複数台接続された空気調和装置でも同様の効果を奏することはいうまでもない。また、熱源機側熱交換器３と直列または並列に氷蓄熱槽や水蓄熱槽が設置されていても同様の効果を奏することは明らかである。また、熱源機Ａが複数台並列に接続された空気調和装置においても同様の効果を奏することは明らかである。また、この実施の形態では空気調和装置について説明したが、冷凍機やチラーについても同様の効果が得られる。

【００７１】特に、冷凍機油としてエーテル油またはエステル油またはアルキルベンゼン油を用いた場合、これらの冷凍機油にはＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた第1の接続配管Ｃ、第2の接続配管Ｄに残留する、ＣＦＣやＨＣＦＣを用いていた空気調和装置の冷凍機油である鉱油が溶解しないため、ＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた第1の接続配管Ｃ、第2の接続配管Ｄを使用する場合、空気調和装置の冷凍サイクルにおいて、残留物である鉱油が分離し、冷凍サイクルに悪影響を及ぼす可能性があり、十分な洗浄が必要であり、この実施の形態の空気調和装置による洗浄運転は特に有効である。また、冷媒としてハイドロフルオロカーボンまたはハイドロカーボンまたはアンモニアまたは二酸化炭素を用いた空気調和装置においては、ＣＦＣやＨＣＦＣを用いていた空気調和装置で使用していた第1の接続配管Ｃ、第2の接続配管Ｄに残留する鉱油や塩素系化合物や硫黄系化合物がハイドロフルオロカーボンまたはハイドロカーボンまたはアンモニアまたは二酸化炭素の冷媒に溶解しにくく、冷凍サイク

ルに悪影響を及ぼす可能性があり、十分な洗浄が必要であり、この実施の形態の空気調和装置による洗浄運転は特に有効である。

【００７２】

【発明の効果】この発明は以上のように構成されているので、以下のような効果を奏する。本願の請求項１の発明による冷凍サイクル装置は、圧縮機、熱源側熱交換器等を配管接続した熱源機と、流量調整器、利用側熱交換器等を配管接続した室内機と、前記熱源機と前記室内機とを接続する第1の接続配管及び第2の接続配管と、を備えた冷凍サイクル装置において、蒸発器として使う前記熱源側熱交換器又は前記利用側熱交換器の出口から前記圧縮機の入口間の配管に、細孔部材の間に吸着部材を配置した第1のフィルター装置を有する第1の油回収装置、又は、流入配管開口部に設けた第2のフィルター装置と冷凍機油分離部材を有する第2の油回収装置、を備えたので、冷凍サイクルの第1の接続配管及び第2の接続配管を既設のものを使い、冷媒及びその冷媒用の冷凍機油を新規なものに変更しても、第1の油回収装置又は第2の油回収装置において、既設の第1の接続配管及び第2の接続配管の変更前の冷媒及び冷凍機油に起因する残留物が変更後の冷媒ガスから分離回収でき、特に、吸着部材、冷凍機油分離部材により変更前の冷凍機油をそれぞれ吸着除去、透過除去でき、既設配管の有害性を低減できる。

【００７３】また、請求項２の発明による冷凍サイクル装置は、請求項1の発明において、前記第1の油回収装置の第1のフィルター装置の吸着部材が活性炭としたので、塩素を含む冷媒に使われる鉱油を吸着除去でき、又、塩素を含む冷媒が劣化して生じる塩素化合物や硫黄化合物を吸着除去できる。

【００７４】また、請求項３の発明による冷凍サイクル装置は、請求項1の発明において、前記第1の油回収装置の第1のフィルター装置の吸着部材が繊維状吸着材としたので、塩素を含む冷媒に使われる鉱油を吸着除去できる。又、油中に溶解している塩素化合物及び硫黄化合物を吸着除去できる。

【００７５】また、請求項４の発明による冷凍サイクル装置は、請求項１、請求項2又は請求項３の発明において、前記第1の油回収装置は、前記第1のフィルタ装置を収容する容器と、前記容器下部に設けた、流入配管の開口部と、前記容器上部に設けた、流出配管の開口部とを備え、前記第1のフィルター装置を前記両開口部間に備えたので、容器下部の流入管開口部から出た油分は容器の下部に溜り、冷媒ガスと共に容器内を上昇する鉱油等が減少でき、過剰な吸着部材を必要とせず、確実に吸着され、冷媒ガスから分離除去される。

【００７６】また、請求項５の発明による冷凍サイクル装置は、請求項１の発明において、前記第2の油回収装置の冷凍機油分離部材は、流体の分子の大きさが所定の大きさ以下のものを透過するので、例えば、分子のより大きなエステル油と分子のより小さな鉱油とを分離し、鉱油を除去できるように分子量の異なる冷凍機油の有害な冷凍機油を分離除去できる。

【００７７】また、請求項６の発明による冷凍サイクル装置は、請求項１から請求項５のいずれか1項の発明において、蒸発器として使う前記熱源側熱交換器又は前記利用側熱交換器の出口から前記圧縮機の入口間の配管に前記油回収装置とともに設けた所定の冷凍機油の油濃度を検知する油濃度検知装置と、配管切換装置を介して接続した前記油濃度検知装置と前記油回収装置とをバイパスするバイパス配管とを備え、前記油濃度検知装置の所定の冷凍機油の検出濃度が所定値以下となった場合に、前記配管切換装置により冷媒等の流れを前記油濃度検知装置と前記油回収装置側の配管から前記バイパス配管側へ切換えるので、冷凍サイクル装置に有害である所定の冷凍機油の洗浄が終了したことを知ることができ、冷媒等が流れる配管をバイパス配管に切換えることにより冷凍サイクルの流路抵抗を低減できる。

【００７８】また、請求項７の発明による冷凍サイクル装置は、請求項６の発明において、前記油濃度検知装置と前記油回収装置とを接続する配管で、前記両装置の上流側と下流側にそれぞれ配管切離し装置を備え、前記油濃度検知装置の所定の冷凍機油の検出濃度が所定値以下となった場合に、前記配管切換装置により冷媒等の流れを前記油濃度検知装置と前記油回収装置側の配管から前記バイパス配管側へ切換え、かつ、前記配管切離し装置により前記油濃度検知装置と前記油回収装置とを切離すので、請求項6の発明の効果に加えて、油濃度検知装置と油回収装置とを他の既設配管を使用する冷凍サイクルの更新時の洗浄に利用できる。

【００７９】また、請求項８の発明による冷凍サイクル装置は、圧縮機、熱源側熱交換器等を配管接続した熱源機と、流量調整器、利用側熱交換器等を配管接続した室内機と、前記熱源機と前記室内機とを接続する第1の接続配管及び第2の接続配管と、を備えた冷凍サイクル装置において、蒸発器として使う前記熱源側熱交換器又は前記利用側熱交換器の出口から前記圧縮機の入口間の配管に油回収装置を備え、前記第1の接続配管及び前記第2の接続配管を既存の第1の冷媒のものを使用し、前記熱源機及び前記室内機とを新しく使う第２の冷媒用のものに更新する冷凍サイクルで、前記第2の冷媒及びその冷凍機油を用いて前記第1の接続配管及び第2の接続配管を洗浄運転するので、煩雑で、長時間を要し、作業コストの高い専用の洗浄剤による洗浄をする必要がなく、新しく使う第2の冷媒及びその冷凍機油による洗浄により、前に使っていた第1の冷媒及びその冷凍機油に起因する残留物を油回収装置により分離、除去し、そのまま冷凍サイクル装置の運転が可能となる。

【００８０】また、請求項９の発明による冷凍サイクル装置は、請求項８の発明において、前記第2の冷媒とし

てハイドロフルオロカーボン、ハイドロカーボン、アンモニア又は二酸化炭素を用いるので、これらの冷媒に溶解しない有害な油分、塩素化合物、硫黄化合物を除去することができる。

【００８１】また、請求項１０の発明による冷凍サイクル装置は、請求項８の発明において、前記冷凍機油としてエーテル油、エステル油又はアルキルベンゼン油を用いるので、これらの冷凍機油に溶解しない有害な油分、塩素化合物、硫黄化合物を除去することができる。

【図面の簡単な説明】

【図１】　この発明の実施の形態１による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図。

【図２】　この発明の実施の形態１の油濃度検知装置を示した図。

【図３】　この発明の実施の形態１のＨＦＣ用冷凍機油の鉱油濃度に対する屈折率の関係を示した図。

【図４】　この発明の実施の形態１の油濃度検知装置のＨＦＣ用冷凍機油と鉱油混合物の屈折率測定方法示した図。

【図５】　この発明の実施の形態１の第1の油回収装置＊を示した図。

【図６】　この発明の実施の形態１の第1の油回収装置の活性炭による塩素化合物の吸着性能を示した図。

【図７】　この発明の実施の形態２による冷凍サイクル装置の一例として、空気調和装置の冷媒回路を示す図。

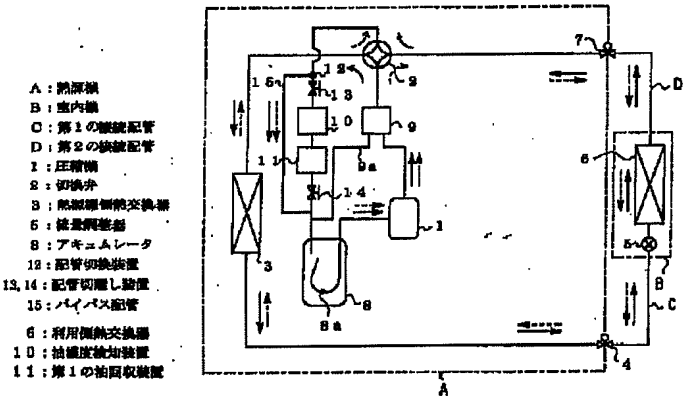
【図８】　この発明の実施の形態２の第2の油回収装置を示した図。

【図９】　従来の空気調和の冷媒回路を示す図。

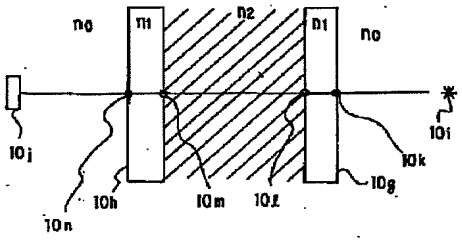
【符号の説明】

Ａ　熱源機、　Ｂ　室内機、　Ｃ　第１の接続配管、　Ｄ　第２の接続配管、Ｅ　熱源機、　１　圧縮機、　２　切換弁、　３　熱源機側熱交換器、　５　流量調整器、　６　利用側熱交換器、　１０　油濃度検知装置、　１１　第1の油回収装置、１６　第2の油回収装置、８　アキュムレータ、　１１ａ　容器、１１ｄ　開口部、　１１ｅ　細孔部材、　１１ｆ　吸着部材（プロピレン製不職布）、　１１ｇ　吸着部材（活性炭）、　１１ｉ　細孔部材、　１２　配管切換装置、　１３、１４　配管切離し装置、　１５　バイパス配管、　１６ｆ　第2のフィルター装置、　１６ｇ　冷凍機油分離部材。

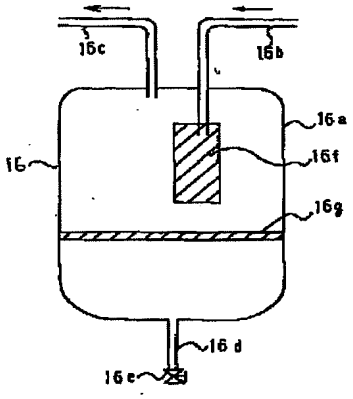
【図１】



【図４】

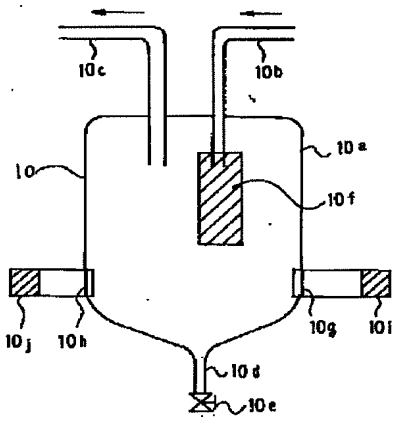


【図８】

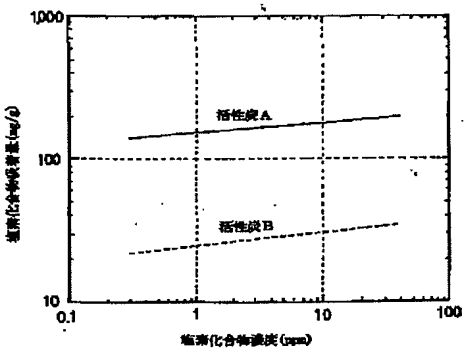


16f：第２のフィルター装置
16g：冷凍機油分離部材

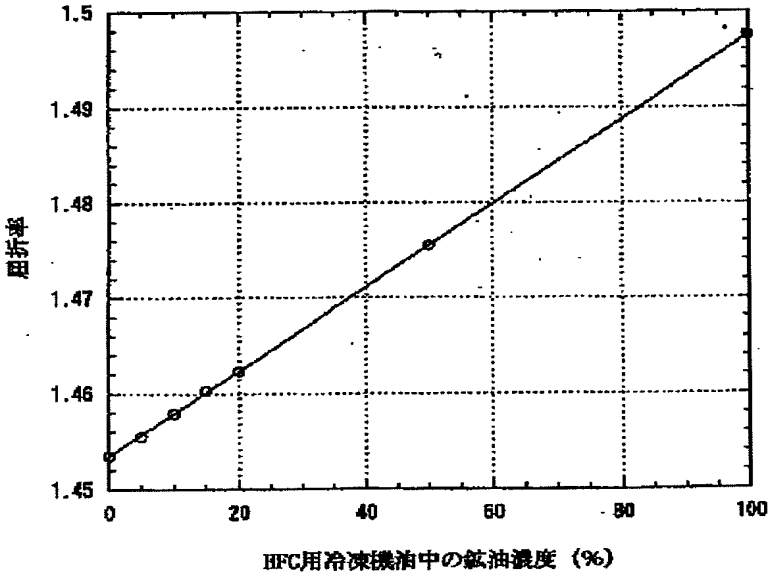
【図２】


10c
10b
10a
10
10f
10j
10h
10g
10i
10d
10e

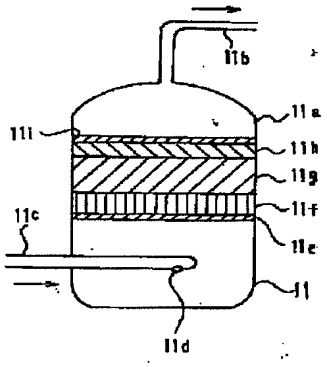
【図６】


1,000
100
10
0.1
1
10
100
活性炭A
活性炭B

【図３】

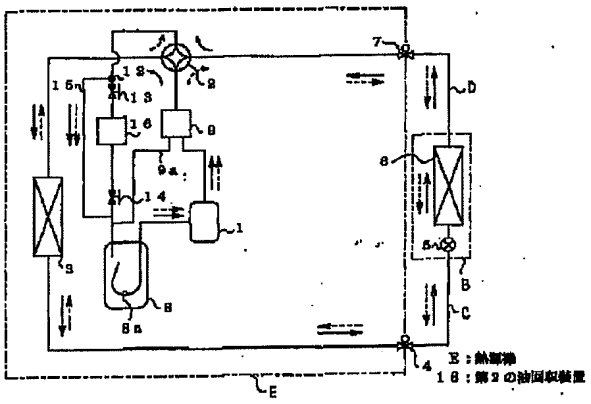

1.5
1.49
1.48
1.47
1.46
1.45
0
20
40
60
80
100
屈折率
HFC用冷凍機油中の鉱油濃度（%）

【図５】



11a:容器
11d:開口部
11e:細孔部材
11f:吸着部材（　繊維状吸着材　）
11g:吸着部材(活性炭)
11i:細孔部材

【図７】



【図９】